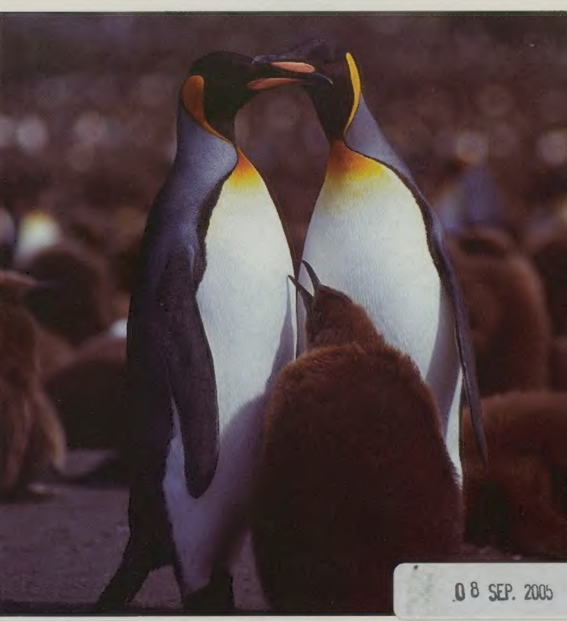
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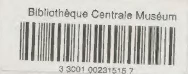


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BIOLOGIE DE REPRODUCTION DE LA TOURTERELLE DES BOIS *Streptopelia turtur* DANS LE PÉRIMÈTRE IRRIGUÉ DU HAOUZ (MARRAKECH - MAROC)

Saâd HANANE & Mohamed MAGHNOUJ



Breeding biology of Turtle Dove *Streptopelia turtur* in the Marrakech region (Morocco). The breeding biology of Turtle Dove was studied in 2003 and 2004 in olive groves in irrigated areas of the Haouz. Turtle Doves built their nests at an average height of 2,74 ± 0,61 m (n = 204) from the ground, and at 1,88 ± 0,62 m from the trunk, at 1,48 ± 0,75 m from the upper canopy at 2,13 ± 0,57 m from the lowest part of the canopy. On the taller trees, birds tended to build their nests higher above and towards the external part of the tree. Birds arrived from migration by mid March and began nest-building between the end of the month and early April. Egg-laying started during the first weeks of April, with the latest were recorded during the last weeks of July. Hatching was noted from the last weeks in April until mid August. The breeding season lasted about five months, from first egg-laying to last fledged chicks. Average clutch size was 1,94 eggs per nest in 2003 and 1,96 in 2004, two eggs clutches were dominant (94% in 2003 and 96% in 2004). Nest desertion (41,8%, n = 304) and predation (32,2%) were the main causes of failure at the egg stage. At the chick stage, predation was the most important cause of fledging failure (77,1%, n = 35). Breeding success as defined by the proportion of nests for which at least one chick fledged was 55,0% in 2003 and 44,7% in 2004 with a productivity of respectively 1,1 and 0,9 fledged chicks per nest. Average density of nests with eggs over the whole study was of 28,2 nests per hectare.

Mots clés : Biologie de reproduction, Tourterelle des bois, Oliveraies, Périmètre irrigué du Haouz, Marrakech, Maroc.

Key words: Breeding biology, Turtle Dove, Olive groves, Irrigated area of the Haouz, Marrakech, Morocco.

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INTRODUCTION

Au Maroc, la Tourterelle des bois *Streptopelia turtur* est un migrateur nicheur qui est distribué sur une grande surface du territoire national du Nord du pays jusqu'aux oasis et palmeraies du Sud où elle atteint le Bas et le Moyen Draâ (Goulmime, Assa et près de la plage blanche), le Dadès-Draâ (jusqu'à Zagora), le Tafilalt (jusqu'à Merzouga) et le Sud-Est Saharien (région de Figuig) (THÉVENOT

et al. 2003). Elle se reproduit jusqu'à 2000 metres au moins dans le Haut Atlas (BARREAU *et al.*, 1987, BARREAU & BERGIER 2000-2001)

Malgré cette vaste distribution géographique, les effectifs au Maroc sont mal connus et les études sur la biologie de reproduction de l'espèce sont rares (MARRAHA, 1992; BARREAU & BERGIER 2000-2001). Le présent travail, réalisé dans les oliveraies du périmètre irrigué du Haouz (région de Marrakech) au cours des années 2003 et 2004, avait pour but d'approfondir nos connaissances à ce sujet et de caractériser la population nicheuse marocaine, tout en comparant nos résultats à ceux obtenus dans plusieurs pays européens.

MILIEU D'ÉTUDE

Le périmètre irrigué du Haouz (région de Marrakech), d'une superficie de 311 000 ha, est caractérisé par des sols de nature essentiellement isohumique (75 % de la surface irriguée), calcimagnétique (15 %) et peu évolué (10 %). Dans la région d'étude, le climat est de type semi-aride caractérisé par des précipitations concentrées sur la période froide et une sécheresse estivale plus ou moins accentuée et prolongée (BARREAU & BERGIER, 2000-2001) (TAB. I).

TABLEAU I.– Principales caractéristiques climatiques dans le périmètre irrigué du Haouz.
Main climatic characteristics of the irrigated area of the Haouz

PÉRIMÈTRE IRRIGUÉ DU HAOUZ	
Précipitations moyennes annuelles	240 (mm)
Température moyenne annuelle	20 °C
Température moyenne maximale (Juillet)	37 °C
Température moyenne minimale (Janvier)	4 °C
Hygrométrie	40 % en moyenne en été 70 % en hiver
Évaporation	2 300 mm/an

D'après l'Office régional de mise en valeur agricole du Haouz

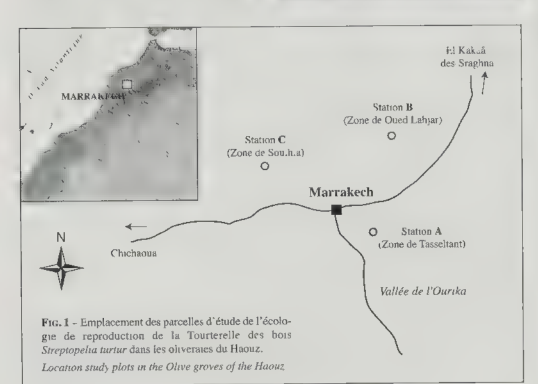


FIG. 1 - Emplacement des parcelles d'étude de l'écologie de reproduction de la Tourterelle des bois *Streptopelia turtur* dans les oliveraies du Haouz.
Location study plots in the Olive groves of the Haouz

Tableau II.– Importance de la céréaliculture et de l'arboriculture dans le périmètre irrigué du Haouz
Importance of cereal and tree crops in the irrigated area of the Haouz

	Types de culture	Essences	Superficie Hectares	(%)
Arboriculture	Cultures fruitières	Oliveraies	85000	95
		Agrumes	4000	5
		Total	**89000**	**100**
Céréaliculture	Cultures céréalières	Blé tendre	106000	41
		Blé dur	46000	18
		Orge	104000	41
		Total	**256000**	**100**

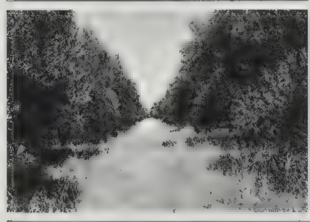


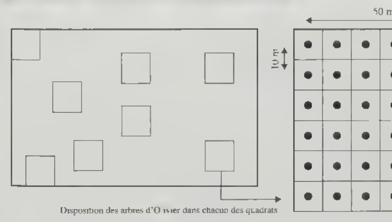
Photo 1 – Formation en ligne d'Oliviers *Olea europea* : le cas de la station A) (Photo Saâd Hanane)
Olive grove with aligned trees : as in plot A

L'occupation du sol dans le périmètre est dominée par les cultures céréalières et l'arboriculture (Tab. II) surtout des oliveraies qui offrent de fortes potentialités pour la nidification de la Tourterelle des bois (Fig. 1)

MÉTHODOLOGIE

L'étude de la biologie de la reproduction de la Tourterelle des bois dans les oliveraies du périmètre irrigué du Haouz a été menée pendant deux années successives (2003 et 2004) durant la période "début mars-fin août" avec une fréquence d'une prospection tous les quinze jours

Les données se rapportant à la densité des couples et au suivi de la phénologie de la reproduction (ponte, éclosion et envol) ont été collectées à partir de 24



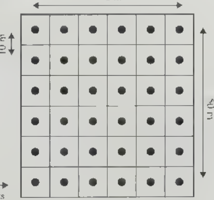


Fig. 2 Exemple d'emplacement et de disposition d'arbres d'oliviers dans chacun des quadrats d'étude (le cas de la station A)
Example of position and disposition of Olive Trees in studied quadrat (plot A)

quadrats (carrés échantillons) d'une surface unitaire de 2500 m² (1/4 ha) distribués d'une manière aléatoire sur l'ensemble des trois stations d'étude (8 quadrats par station). L'adoption d'un échantillonnage de type aléatoire simple a été dictée par :

- La nature plate du relief ;
- L'homogénéité et la structure du peuplement (oliveraies pures).

Chacun des quadrats contenait 36 arbres (6 x 6) espacés de 10 m (FIG. 2). Le taux d'échantillonnage a été de 50 % (864 arbres prospectés pour un total de 1728). La surface de chacune des stations était de cinq hectares.

À chacune des visites et dans chaque surface échantillon une fouille systématique des arbres a été menée. Pour chaque nid trouvé, nous avons noté son état (oiseau couvant, nombre d'œufs, nombre de poussins, pertes et natures des pertes des œufs et/ou poussins…), son emplacement dans le quadrat (marquage de l'arbre supportant le nid) et son emplacement sur l'arbre (opération réalisée en 2004). Les mesures suivantes ont été prises :

- Hauteur de l'arbre (HA) ;
- Distance du nid au sol (HS) ;
- Distance du nid à la partie inférieure du feuillage (D. Inf) ;
- Distance du nid au tronc (D. Tr) ;
- Distance du nid à la partie extérieure du feuillage (DE).

Les mesures de l'emplacement des nids sur l'arbre ont été prises à l'aide d'une barre graduée de 6 m. Une reproduction a été considérée réussie si au moins l'un des poussins s'est envolé.

RÉSULTATS

Migration prénuptiale et construction des nids

Au Maroc, les premières Tourterelles des bois arrivées des zones d'hivernage (Afrique de l'Ouest) sont observées dans le périmètre irrigué du Souss-Massa (région d'Agadir) à partir de la première quinzaine du mois de mars. Dans la région du Haouz, les premiers oiseaux ont été notés le 16 mars en 2003 (2 oiseaux) et le 15 mars en 2004 (4 oiseaux). La construction des nids a débuté fin mars et début avril.

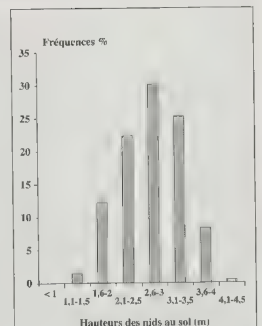


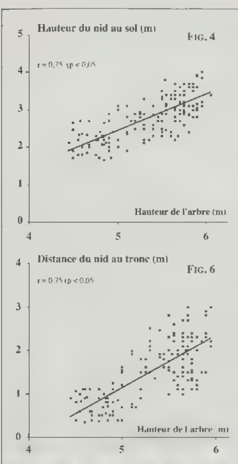
FIG. 3.- Hauteur au sol des nids de la Tourterelle des bois *Streptopelia turtur* dans les oliveraies (n = 204).

Turtle Dove Streptopelia turtur *nest height in Olive groves (n=204).*

Emplacement des nids

La hauteur des nids au sol a varié de 1,3 à 4,1 m avec une moyenne de 2,74 m (écart-type = 0,61 m, n = 204).

La plupart des nids ont toutefois été construits à une hauteur comprise entre 2,1 et 3,5 m (78 %, n = 204) (FIG. 3), plutôt en partie périphérique de la frondaison et séparés du sol par une épaisse couche de feuillage. Les distances moyennes des nids aux troncs et celles des nids à la partie inférieure et extérieure du feuillage ont été respectivement de 1,88 ± 0,62 m, de 2,13 ± 0,57 m et de 1,48 ± 0,75 m alors que la hauteur moyenne des arbres était de 5,34 ± 0,46 m.



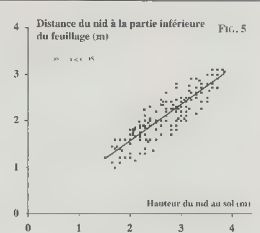


FIG. 4 Relation entre la hauteur de l'arbre et la hauteur du nid au sol *Relationship between tree and nest height*

FIG. 5.– Relation entre la hauteur du nid au sol et la distance le séparant de la partie inférieure du feuillage. *Relationship between nest height and distance from the nest to the lowest part of the canopy*

FIG. 6 Relation entre la hauteur de l'arbre et la distance du nid au tronc. *Relationship between nest height and distance from the nest to the trunk*

PHOTO 2 – Ponte de deux œufs (Photo Saâd HANANE) *Two eggs clutch*



Densité des nids

Lors des deux années de suivi, la densité moyenne des nids avec œufs par hectare (TAB. III) a été de 28,2 ± 12,9 nids. Cette valeur moyenne masque toutefois une nette variabilité spatiale (41,2 nids/ha ± 14,1 à la station A, 23,8 ± 4,7 à la station B et 19,8 ± 4,7 à la station C) et temporelle (22,5 ± 6,6 en 2003 et 34 ± 15,1 en 2004). En 2004, la station (A) a été la plus accueillante du fait de la morphologie de ses arbres touffus et à branches bien étalées, de la richesse céréalière environnante et de l'absence de toute forme d'activité humaine. Les deux autres stations (B et C) ont été moins fréquentées à cause d'un support végétal moins favorable (arbres relativement moins touffus), d'une présence humaine quasi permanente liée surtout aux activités agricoles (élevage, labour, irrigation, traitement phytosanitaire...) et d'une moindre richesse céréalière environnante.

Ponte

Les premières pontes ont été déposées durant la première quinzaine du mois d'avril (le 11 en 2003 et le 9 en 2004). En 2003, le nombre de pontes a augmenté très rapidement pour culminer dans la première quinzaine du mois de mai (28 % des pontes) alors qu'en 2004, ce nombre a augmenté progressivement pour atteindre son maximum dans la deuxième quinzaine de mai (24 % des pontes). Les dernières pontes ont été notées apres le 15 juillet, aussi bien en 2003 qu'en 2004 (FIG. 7).

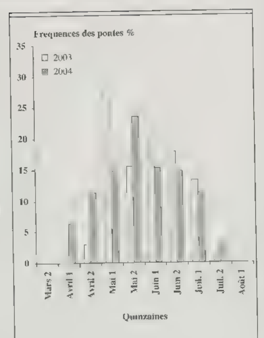


FIG. 7.– Déroulement des pontes de la Tourterelle des bois *Streptopelia turtur* dans les oliveraies du périmètre irrigué du Haouz en 2003 (n = 135) et en 2004 (n = 204).

Turtle Dove Egg laying in olive groves of the irrigated area of the Haouz in 2003 (n = 135) and 2004 (n = 204).

TABLEAU III.– Densité moyenne des nids avec œufs de la Tourterelle des bois *Streptopelia turtur* dans les trois stations d'étude en rapport avec la richesse céréalière environnante et l'activité humaine.
Average density of Turtle Dove nests with eggs in the three studied plots in relation to adjacent cereal cultivation and human activities.

STATIONS ET ZONES D'ÉTUDE	SURFACE CÉRÉALIÈRE (HA)	NATURE DE L'ACTIVITÉ HUMAINE		DENSITÉ DES NIDS (HA)		
		2003	2004	2003	2004	2003-2004
Station A (Tassestant)	2600	Fauchage d'herbes	Aucune	30,0	52,5	41,2
Station B (oued Lahjar)	2000	Labour et irrigation	Labour et irrigation	21,0	26,5	23,8
Station C (Souihla)	800	Labour, irrigation et traitement phytosanitaire	Labour et irrigation	16,5	23,0	19,8
Station A + B + C				**22,5**	**34,0**	**28,2**

Éclosion

Les premieres éclosions ont été notées au cours de la seconde moitié d'avril aussi bien en 2003 (n = 1) qu'en 2004 (n = 10). Le déroulement des éclosions (Fig. 8) a suivi celui des pontes avec un décalage de quinze jours correspondant à la durée d'incubation de l'espèce (Cramp, 1985) En 2003, le maximum des éclosions a eu lieu dans la deuxième quinzaine du mois de mai (29,7 %) alors qu'en 2004 c'est à la première quinzaine de juin qu'il a été enregistré (26 %). Au cours des deux années de suivi, les dernières éclosions ont lieu dans la première quinzaine du mois d'août.

Grandeur de ponte

La grandeur moyenne des pontes dans l'ensemble de la zone (Tab IV) a été de 1,95 ± 0,21 œufs/nid pour les deux années de suivi (1,94 ± 0,24 œufs/nid en 2003 et 1,96 ± 0,19 œufs/nid en 2004). Les pontes à deux œufs étaient les plus fréquentes aussi bien en 2003 (94 %, n = 135) qu'en 2004 (96 %, n = 204); nous n'avons pas relevé de nids à 3 ou 4 œufs (un cas à 4 œufs cité par Barreau & Bergier, 2000-2001, provenant sans doute de deux pontes différentes et par la suite abandonnnés).

Succès de la reproduction

Stade œufs.– Sur un total de 662 œufs trouvés (262 en 2003 et 400 en 2004), seuls 358 (54,1 %) ont éclos. Les 304 autres (45,9 %) ont été victimes de différents facteurs de pertes (Fig. 9), dont les plus importants sont l'abandon (41,8 %) et la prédation (32,2 %) Les autres facteurs identifiés sont la destruction (16,1 %), le ramassage (3,9 %) et la présence d'œufs non féconds (2,0 %)

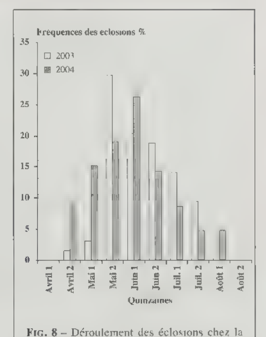


Fig. 8 – Déroulement des éclosions chez la Tourterelle des bois *Streptopelia turtur* dans les oliveraies du périmètre irrigué du Haouz en 2003 (n = 71) et en 2004 (n = 105)

Turtle Dove hatching chronology in Olive groves of the irrigated area of the Haouz in 2003 (n = 71) and 2004 (n = 105)

Stade poussins.– Le pourcentage de perte au stade poussins pour l'ensemble des deux années de suivi a été de 9,8 % (n = 35 cas sur 358 nids) mais a varié de 5,3 % (n = 8 cas sur 152) en 2003 à 13,1 % (n = 27 cas sur 206) en 2004 La principale

Tableau IV – Grandeur des pontes complètes de la Tourterelle des bois *Streptopelia turtur* dans les oliveraies du périmètre irrigué du Haouz

Turtle Dove clutch size in Olive groves of the irrigated area of the Haouz

Années	Grandeur des pontes		Nombre total d'œufs	Nombre total de pontes	Moyenne d'œufs/nid ± l'écart-type
	1 œuf	2 œufs			
2003	8	127	262	135	1,94 ± 0,24
2004	8	196	400	204	1,96 ± 0,19
2003-2004	16	323	662	339	1,95 ± 0,21

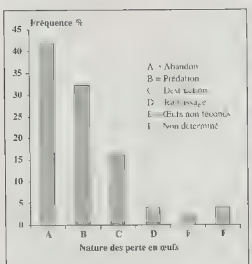


FIG. 9.– Causes des pertes en œufs pour la période 2003 et 2004 (n = 304).
Causes of egg stage failure in 2003 and 2004 (n = 304)

PHOTO 3 - Deux poussins au nid âgés de 7 jours (Photo Saâd HANANE). *Two seven day old chicks*

cause de mortalité, à ce stade, est la prédation (n = 27) qui a enregistré une nette augmentation en 2004 (n = 20) par rapport à l'année 2003 (n = 7) surtout après l'intensification, à la station A, de l'action de Chouettes hulottes *Strix aluco* et de celle de chats errants à la station B. L'abandon au nid de jeunes poussins (n = 8) est un autre facteur de mortalité à ce stade.

Succès de la reproduction de la ponte à l'envol

Le succès de la reproduction de la Tourterelle des bois depuis la ponte jusqu'à l'envol dans l'ensemble des trois stations d'étude (A, B et C) et au cours des deux années de suivi (TAB. V) a été de 48,8 %. Ce pourcentage a été de 55,0 % en 2003 et de 44,7 % en 2004, la diminution d'une année sur l'autre étant principalement due à l'intensité de prédation enregistrée aussi bien au stade œufs (29,1 %, n = 110 en 2003 et 40,2 %, n = 194 en 2004) qu'au stade poussins (cf. ci-dessus) et à l'abandon. La même constatation a été enregistrée pour le pourcentage d'envol par œufs éclos qui a été de 90,2 % pour l'ensemble de l'étude mais a varié de 94,7 % en 2003 à 86,9 % en 2004.

TABLEAU V. – Réussite de la reproduction de la Tourterelle des bois *Streptopelia turtur* dans les oliveraies du périmètre irrigué du Haouz.
Turtle Dove breeding succes in Olive groves of the irrigated area of the Haouz.

	2003	2004	2003 + 2004
Nombre d'œufs trouvés	262	400	662
Pourcentage d'œufs éclos	58,0	51,5	54,1
Pourcentage de poussins envolés / œufs éclos	94,7	86,9	90,2
Pourcentage de poussins envolés / œufs pondus	55,0	44,7	48,8
Nombre de poussins envolés / nid	1,1	0,9	0,9

Migration post-nuptiale

Dans la région d'étude, les départs et les passages des populations nord marocaines et européennes vers les zones d'hivernage sont généralement notés à partir du mois d'août et se poursuivent jusqu'à la fin du mois de septembre. Des oiseaux ont toutefois été encore observés au cours du mois d'octobre (le 13 dans la région de Rabat et le 20 dans le Haouz).

DISCUSSION

Les dates de retour des Tourterelles des bois enregistrées en 2003 et 2004 entrent dans la marge temporelle d'arrivée de l'espèce pour le Maroc nord-atlantique en général (24 mars ± 16 jours, THÉVENOT & BEAUBRUN, 1983a) et le Haouz en particulier (24 mars, n = 8 ans, extrêmes 11 mars - 6 avril, BARREAU & BERGIER, 2000-2001).

Dans les oliveraies, comme sur d'autres essences fruitières et forestières, la hauteur moyenne du nid au sol de la Tourterelle des bois ne dépasse pas le seuil des 3 mètres comme le signalent la majorité des études sur l'écologie de reproduction de l'espèce (TAB VI). Les extrêmes présentent toutefois une nette variabilité en fonction de la nature et du type d'arbre choisi. BARREAU & BERGIER (2000-2001) ont par exemple trouvé un nid à 1 mètre du sol sur un Tamaris, deux à 1,2-1,5 mètres dans des Figuiers de Barbarie, ou un autre à 6 mètres sur un Faux Poivrier

Dans cette étude, la plupart des nids ont été construits entre 2,1 et 3,5 m (78,4 %, n = 204), cette tranche de hauteur s'insère dans les marges de variation enregistrées en Europe.



PHOTO 4 Rassemblement de 113 Tourterelles des bois sur une ligne à haute tension le 2 mai 2005 près de Marrakech (Photo Saâd HANANE).

Turtle Doves on a powerline near Marakesh.

TABLEAU VI Comparaison de la hauteur moyenne des nids de la Tourterelle des bois *Streptopelia turtur* dans les oliveraies et sur d'autres supports végétaux au Maroc et en Europe.

Comparative Turtle Dove nest height in Europe and Morocco and in Olive grove and other habitats

Support végétal	Pays	Hauteur moyenne du nid au sol (m)	Hauteur mini. (m)	Hauteur maxi. (m)	Nombre de nids	Références
Oliveraies	Algérie		1,4	4	18	NONEV & GUENOV (1989)
	Espagne	2,32	0,5	6	225	ICONA (1989) *in* BOUTIN (2001)
		2,58				PEIRO (2001)
	Maroc (Haouz)	–	1,5	4	18	BARREAU & BERGIER (2000-2001)
	Maroc (Haouz)	**2,74**	**1,3**	**4,1**	**204**	**Présente étude**
Autres supports végétaux	Grande	2,4		13		MURTON (1968)
	Bretagne	2,27	0,2	12,2	1854	BROWNE *et al.* (2005)
			0,1	20		BROWNE & AEBISCHER (2004)
	Bulgarie	-	1,1	6	67	NANKINOV (1994)
	France	1,5 - 2			59	AUBINEAU & BOUTIN (1998)
	Maroc	2,8	2	12	246	MARRAHA (1992)
	Maroc (Haouz)		1	6	53	BARREAU & BERGIER (2000-2001)

Tableau VII Emplacements comparés des nids de la Tourterelle des bois *Streptopelia turtur* dans les oliveraies du Maroc et d'Espagne

Turtle Dove nest positioning in Olive groves in Morocco and Spain

Pays et site d'étude	Hauteur de l'arbre (m)	Distance du nid à la partie inférieure du feuillage (m)	Distance du nid au tronc (m)	Distance du nid à la partie extérieure du feuillage (m)	Références
Espagne (Sud-Ouest de Madrid)	4,18	1,88	1,28	1,17	Peiro (2001)
Maroc (Région du Haouz)	**5,34 ± 0,46**	**2,13 ± 0,57**	**1,88 ± 0,62**	**1,48 ± 0,75**	**Présente étude**

Tableau VIII Chronologie comparée des pontes et de la durée de la période de reproduction de la Tourterelle des bois *Streptopelia turtur* au Maroc et en Europe

Comparative chronology of egg-laying and duration of breeding season in turtle Dove in Morocco and Europe

Pays	Période des premières pontes	Durée de la période de reproduction (jours)	Références
Espagne	Première quinzaine de mai	110 à 118	Peiro (1990)
Bulgarie	Seconde quinzaine d'avril	138	Sankinov (1989)
Grande Bretagne	Seconde quinzaine de mai Seconde quinzaine de mai (18 mai ± 1 jour)	—	Browne & Aebischer (2004) Browne *et al.* (2005)
France	Seconde quinzaine d'avril	—	Lormée (2004)
Maroc	**Première quinzaine d'avril**	**145**	**Présente étude**

Le choix de l'emplacement des nids (hauteur du nid au sol, distance au tronc et distance à la partie inférieure du feuillage) est fonction de la hauteur de l'arbre comme cela fut constaté par Marraha (1992) Ainsi, plus l'arbre est haut plus le nid est construit à une hauteur élevée, vers la périphérie de la frondaison. Cette tendance à occuper la partie extérieure des branches et à disposer d'un feuillage suffisant sous le nid (arbres touffus) constitue un moyen de prévention et de camouflage contre les attaques de prédateurs comme cela fut souligné en Espagne dans les oliveraies du Sud–Ouest de Madrid (Peiro, 2001) (Tab. VII) En Grande Bretagne, Browne & Aebischer (2005) ont aussi souligné cette préférence de l'espèce pour les arbres hauts et touffus

Dans les oliveraies du Haouz, la densité moyenne des nids par hectare était de 28,2 Cette importante densité avait déjà été mentionnée par Barreau & Bergier (2000-2001) qui annonçaient qu'elle pouvait atteindre plusieurs dizaines de couples à l'hectare. Ainsi, le nombre de reproducteurs dépasse de loin celui signalé en Suisse (20 couples/100 ha ; 20 25 couples/100ha) respectivement par Géroudet (1983) et Schifferli (1980), en Espagne (1,4-38,6 couples/100 ha) par ICONA (1989) *in* Boutin (2001) ou en Angleterre (0,5-4,1 couples/100 ha) par Calladine *et al.* (1997).

Si la richesse en culture céréalière s'avère déterminante sur la densité de nidification comme il fut signalé en Extremadure (Espagne) par Hidalgo & Rocha (2001), il n'en demeure pas

moins que la morphologie des arbres (liée généralement à leur âge et à la qualité de leur entretien) associée à une bonne quiétude constitueraient d'autres facteurs incitatifs d'installation des couples.

En 2003 comme en 2004, la période maximale de dépôt d'œufs a lieu au cours du mois de mai (première quinzaine en 2003 et seconde moitié en 2004) comme l'avaient mentionné BARREAU & BERGIER (2000-2001) (29 pontes déposées lors des 3e et 4e semaine de ce mois). La durée globale de la période de reproduction (depuis le dépôt des premiers œufs à l'envol des derniers poussins) a été, au cours des deux années de suivi, de prés de cinq mois (TAB. VIII). Dans cette zone, la principale période de reproduction se déroule de la première quinzaine de mai à la seconde moitié de juin. En Péninsule ibérique, cette dernière se trouve retardée d'un mois (de la première quinzaine de juin à la première moitié d'août) (PEIRO, 1990).

La grandeur moyenne de ponte a été estimee à 1,95 ± 0,21 œufs/nid. Cette production moyenne est pratiquement identique à celle relevée en Europe (TAB. IX).

Le succès de reproduction de la Tourterelle des bois a été de 48,8 %. Ce taux est du même ordre de grandeur que ceux connus en Europe (TAB. X), les échecs étant principalement liés à l'intervention humaine (dérangement, ramassage, chasse, traitement phytosanitaire, destruction...) et à la prédation (chats errants, reptiles, rapaces...) comme en Grande-Bretagne (MURTON, 1968), en Espagne (GUTTIEREZ, 2001 ; ROCHA & HIDALGO, 2002 et PEIRO, 2001) ou en France (LORMEE, 2004).

Dans le Haouz, la période des départs postnuptiaux est la même que celle annoncée par BARREAU & BERGIER (2000-2001). Cette dernière s'insère dans la marge temporelle indiquée pour le Maroc nord Atlantique par THÉVENOT & BEAUBRUN (1983 a) (9 octobre ± 15 jours).

CONCLUSION

Les résultats acquis par la présente étude ont permis d'améliorer les connaissances sur la biologie de reproduction de la Tourterelle des bois au Maroc (densité des nids, chronologie de reproduction et facteurs d'échecs) et ont confirmé l'importance que revêtent les oliveraies du périmètre

TABLEAU IX - Grandeur moyenne de ponte la Tourterelle des bois *Streptopelia turtur* au Maroc et en Europe. *Average Turtle Dove clutch size in Morocco and Europe.*

Pays et site d'étude	Grandeur moyenne des pontes	Références
Grande Bretagne (Cambridgeshire)	1,9	MURTON (1968)
Espagne (Sud-Ouest de Madrid)	1,95	PEIRO (2001)
Extremadure	1,96 ± 0,2	ROCHA & HIDALGO (2002)
Grande Bretagne (Cambridgeshire)	1,9 ± 0,1	BROWNE & AEBISCHER (2004)
Grande Bretagne	1,84 ± 0,01	BROWNE *et al.* (2005)
Maroc (en général)	1,98 ± 0,18	THÉVENOT *et al.* (2003)
Maroc (Région du Haouz)	**1,95 ± 0,21**	**Présente étude**

TABLEAU X – Réussite comparée de la reproduction la Tourterelle des bois *Streptopelia turtur* au Maroc et en Europe. *Comparison of Turtle dove breeding success between Morocco and Europe.*

	MURTON (1968)	CRAMP (1985)	PEIRO (2001)		Présente étude
	1960-1962 & 1966	—	1983	1984	2003-2004
Nombre d'œufs pondus	134	621	128	74	662
% oeufs éclos	46	47	52	74	54,1
% de poussins envolés / œufs éclos	82	82	63		90,2
% de poussins envolés / œufs pondus	37	39	31	51	48,8

irrigué du Haouz pour la nidification de l'espèce. Ces connaissances constituent, sans aucun doute, un support d'informations nécessaire pour une gestion cynégétique rationnelle et adaptée de ce gibier dans la région d'étude

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NIDIFICATION URBAINE ET À L'INTÉRIEUR DES TERRES DU GOÉLAND LEUCOPHÉE *Larus michahellis* EN ALGÉRIE

Riadh MOULAÏ[1], Nicolas SADOUL[2] et Salahedine DOUMANDJI[3]

Yellow-legged Gull *Larus michahellis* breeding in urban and inland sites in Algeria. Yellow-legged Gull *Larus michahellis* breeding in urban and inland sites in Algeria. In Algeria, the urban nesting of Yellow-legged Gull is proven in five coastal cities: Jijel, Béjaia, Tigzirt, Algiers and Oran. Urban breeding for this species was first proven in 1999. About thirty pairs are known inland, on an island in the Aïn Zada dam 60 km from the coast. Some data on the breeding biology and the diet of one urban pair from Béjaia are given.

Mots clés : Goéland leucophée, Milieu urbain, Intérieur des terres, Algérie.

Key words: Yellow-legged Gull, Urban area, Inland, Algeria.

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INTRODUCTION

Le Goéland leucophée, *Larus michahellis* est une espèce anthropophile qui connaît depuis une quarantaine d'années une explosion démographique en Méditerranée nord occidentale, où avec un minimum de 120 000 couples nicheurs, il est devenu l'oiseau marin le plus abondant (PERENNOU *et al.*, 1996; THIBAULT *et al.*, 1996). Cette évolution s'est accompagnée d'une saturation progressive des sites d'origines (milieux marins et lagunaires) et a entraîné une extension de l'aire de reproduction et la colonisation de nouveaux milieux (BEAUBRUN, 1993; OLIOSO, 1996; CADIOU, 1997). Dans la partie nord occidentale de la Méditerranée, l'expansion géographique du Goéland leucophée s'est ainsi accompagnée d'une colonisation de l'intérieur des terres, en remontant les bassins du Rhône, du Pô et du Danube, vers le centre de l'Europe (GÉROUDET, 1968; GLUTZ VON BLOTZHEIM & BAUER, 1982; CRAMP & SIMMONS, 1983; OLIOSO, 1993), et de nouveaux milieux parfois atypiques, tels les milieux urbains et industriels (GARCIA PETIT *et al.*, 1986; PETRUCCO & BENUSSI, 1995; CADIOU, 1997).

Dans la partie sud occidentale de la Méditerranée, l'évolution des effectifs de *Larus michahellis* est peu connue (JACOB & COURBET, 1980; VARELA & DEJUANA, 1986; BEAUBRUN, 1988). En Algérie, des recensements récents (MOULAÏ *et al.*, soumis) montrent une forte croissance des effectifs, de près de 8 %, depuis le recensement de 1978 effectué par JACOB & COURBET (1980).

Le présent travail vise à mettre en évidence l'utilisation récente de nouveaux habitats de reproduction par le Goéland leucophée en Algérie. Quelques aspects de la reproduction et le régime alimentaire d'un couple nicheur en milieu urbain seront aussi abordés.

MÉTHODES

Des observations réalisées au niveau de quelques villes du littoral a permi de dresser un aperçu de la nidification en milieu urbain du Goéland leucophée. Seules les bâtisses les plus favorables à l'installation de *Larus michahellis* (GARCIA PETIT *et al.*, 1986) de la vieille ville de Bejaia ont été prospectées (FIG. 1). Pour les autres villes côtieres, les observations sur la nidification urbaine ont été faites au hasard des rencontres. Les dates probables de première nidification en milieu

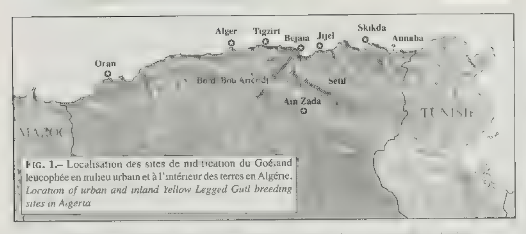


FIG. 1.– Localisation des sites de nidification du Goéland leucophée en milieu urbain et à l'intérieur des terres en Algérie. *Location of urban and inland Yellow Legged Gull breeding sites in Algeria.*

TABLEAU I.– Nidification urbaine et à l'intérieur des terres de *Larus michahellis* en Algérie. *Urban and inland breeding of* Larus michahellis *in Algeria.*

LOCALITÉS	NOMBRE DE COUPLES	ANNÉE PROBABLE DE PREMIÈRE NIDIFICATION	RÉFÉRENCES
Localités urbaines			
Oran	5	2000	
Alger	3	2001	
Tigzirt	1	2003	TALMAT comm. pers.
Bejaia	1	1999	
Jijel	5	2000	
Localités d'intérieur			
Aïn Zada	30	1991	T[illegible]ouk comm. pers.

urbain ou à l'intérieur des terres, proviennent des témoignages des habitants ou des riverains des régions considérés

Un couple nicheur de la ville de Bejaia a été particulièrement suivi. Nous décrivons ici la composition du nid, la date de première ponte, la grandeur de la ponte et le succès de la reproduction. Sept pelotes de réjection d'adultes, trois régurgitats de jeunes et deux contenus stomacaux récupérés sur des poussins trouvés morts sont analysés.

RÉSULTATS

La nidification urbaine du Goéland leucophée a pu être prouvée dans cinq villes côtières. Il s'agit d'Ouest en Est, d'Oran, d'Alger, de Tigzirt, de Bejaia et de Jijel (FIG. 1). Une attention particulière pourrait être apportée dans les localités de Skikda* et de Annaba qui paraissent favorables pour l'accueil des goélands urbains. Le nombre de couples urbains reste encore faible, ce sont les villes d'Oran et de Jijel qui enregistrent les effectifs les plus élevés par rapport aux autres localites, avec 5 couples nicheurs pour chacune des deux villes (TAB. I). La nidification en milieu urbain paraît assez récente, les témoignages recueillis indiquent qu'elle daterait au plus tôt de la fin des années 1990

En ville, les Goélands leucophées s'installent en général sur des bâtiments proéminents, dont les terrasses ou les toitures sont rarement visitées, que ce soit en période de reproduction ou en dehors de celle-ci. Il peut s'agir d'un site historique, comme c'est le cas à Bejaia où l'unique couple nicheur a choisi de s'établir sur le rebord de la toiture d'un ancien fort espagnol (Musée Bordj Moussa). Les Goélands utilisent aussi les terrasses des bâtisses en construction dont les travaux sont arrêtés depuis

**Ndlr. Dans cette ville, P. Isenmann et A. Moali viennent d'observer le 9 juin 2005 un couple avec 2 jeunes non volants sur un toit plat du port.*

plusieurs années, c'est le cas de certains bâtiments à Alger (Hydra) et à Jijel. Enfin les terrasses de certains bâtiments administratifs sont aussi utilisées, ce phénomène est observé à Alger (El Harrach) et à Oran (Université Essenia).

En plus du milieu urbain, ce goéland a commencé à investir des sites de nidification à l'intérieur des terres. Trente couples nicheurs (TAB. I) ont été recensés au mois de mai 2001 dans la région d'Ain Zada, située à plus de 60 km du littoral (FIG. 1). La colonie était installée sur un îlot du lac de barrage d'Ain Zada. L'installation de cette colonie date probablement de l'année 1991 (A. TIKOUK comm. pers.).

Cas du couple urbain de Bejaia. La première tentative de nidification date de 1999. Durant cette année, deux jeunes âgés d'une dizaine de jours ont été trouvés le 24 mai, sur la terrasse du Musée Bordj Moussa. Quelques jours après, les deux jeunes sont retrouvés morts au bas de la bâtisse, certainement effarouchés par les visites répétées du personnel du musée. L'année suivante (2000) aucune nidification n'est signalée sur ce site, en dépit des visites régulières. Le 8 avril 2001, un nid est observé sur le rebord de l'une des toitures du musée et un œuf unique y est déposé le 12 avril. Cet œuf donnera naissance à un jeune qui parviendra à l'envol. En 2002, sur le même site, on a noté une ponte à un seul œuf et comme pour l'année précédente, la reproduction a été couronnée de succès avec un jeune à l'envol.

Pour la confection de leur nid, ce couple a utilisé quatre espèces végétales; *Eucalyptus camaldulensis*, *Oryzopsis miliacea*, *Fraxinus angustifolius* et *Ceratonia siliqua*, mais du matériel divers (laines, fibres synthétiques ossements et débris de coquilles d'œufs) semble largement dominant dans la composition du nid.

L'analyse des pelotes récoltées révèle la présence de 17 items alimentaires, répartis en cinq catégories (TAB. II). La proportion des ordures

TABLEAU II.– Fréquences des items alimentaires identifiés dans les pelotes de rejections de *Larus michahellis* en milieu urbain à Bejaia (N = 7) (F (%) : fréquence centésimale; AN : aliment naturel, OM : ordure ménagère, DC : déchets de chalutage)

Frequency of food items identified in pellets of Larus michahellis *in urban area at Bejaia (N = 7) (F (%), centesimal frequency, AN: natural food, OM: refuse tip food, DC: trawling residues).*

CATEGORIES	ITEMS	ORIGINE	FREQUENCE	F (%)
Vertebrés terrestres	*Columba livia*	AN	4	10,53
	Aves sp	AN	[illegible]	2,63
Dechets carnés	*Bovis* sp	OM	[illegible]	2,63
Déchets de chalutage	*Pisces* sp 1	DC	2	5,26
	Pisces sp 2	DC	1	2,63
Déchets de végétaux	*Poaceae* sp	OM	2	5,26
	Solanaceae sp	OM	2	5,26
	Capsicum annum	OM	1	2,63
	Asteraceae sp	OM	1	2,63
	Fruit sp 1	OM	3	7,89
	Fruit sp 2	OM	3	7,89
Aliments divers	Poils de mammifères	OM	4	10,53
	Fragments de bois	OM	2	5,26
	Fibres synthétiques	OM	4	10,53
	Cailloux	OM	4	10,53
	Fragments de charbon	OM	2	5,26
	Fragments d'aluminium	OM	1	2,63

ménagères (78,9 % de déchets carnés, déchets de végétaux et aliments divers) est élevée, les aliments naturels (*Columba livia*, et *Aves* sp.) viennent en deuxième position avec 13,2 %. Enfin, les déchets de chalutage (*Pisces* sp.) sont faiblement représentés avec 7,9 % (TAB. II). Le contenu des estomacs de poussins, montre l'existence de vers de terre (*Lumbricus* sp.), de poissons (*Sardina pilchardus* et *Trachurus picturatus*), d'oiseaux (*Columba livia*), de mammifères (*Rattus norvegicus*), de déchets d'origine végétale (*Solanaceae sp. et Fabaceae* sp.) et des aliments divers (poils humains et fibres synthétiques). L'analyse des régurgitats prélevés sur les jeunes indique la présence de poissons (*Sardina pilchardus*) et d'oiseaux (*Apus pallidus*).

DISCUSSION

La nidification urbaine des Goélands leucophée de la côte algérienne paraît assez récente et le nombre de villes concernées par ce phénomène n'est pas encore important. Il est vrai que les prospections n'ont pas été systématiques au niveau des villes côtières et plusieurs cas de reproduction en zone urbaine peuvent avoir échappé à notre attention, dans ce cadre CADIOU (1997) indique que les Goélands faisant partie intégrante du paysage des villes portuaires, les premiers nids peuvent s'ils ne sont pas en évidence, passer très facilement inaperçus. La colonisation du milieu urbain pourrait être le signe d'une possible saturation des sites traditionnels de nidification. Un dénombrement des couples nicheurs de Goélands leucophée réalisé en 2002 au niveau de la région de Bejaia, montre ainsi que les effectifs ont été multipliés par plus de sept fois depuis 1978 (MOULAI *et al.*, soumis). La recherche systématique de nouvelles zones de nidification, dont le milieu urbain, est alors souhaitable.

Ailleurs en Méditerranée, la colonisation des zones d'habitations humaines par les Goélands leucophées est plus ancienne : 1970 en Italie (les principales villes étant Gênes, Rome, Naples et Trieste, SOMMANI, 1980; SPANO, 1986; PETRUCCO & BENUSSI, 1995), 1975 dans la ville de Barcelone en Espagne (GARCIA PETIT *et al.*, 1986) et 1983 en France (VINCENT, 1987). Depuis, la reproduction de l'espèce a été constatée dans au moins 20 villes littorales françaises (CADIOU & le GISOM, 1999). L'installation par les goélands est favorisée par plusieurs facteurs; l'existence de nombreuses bâtisses proéminentes, dont les terrasses sont rarement visitées par les humains, la proximité de nombreuses sources d'alimentation et la présence d'une importante population à proximité, dont une partie séjourne en ville durant les périodes hivernale et estivale (GARCIA PETIT *et al.*, 1986).

En ce qui concerne la nidification à l'intérieur des terres, il est probable que les goélands ont colonisé le site du barrage d'Aïn Zada en suivant le cours de l'Oued Bousselam, affluent du grand Oued de Soummam qui rejoint la mer au niveau de Bejaia (FIG. 1). L'utilisation des axes fluviaux est supposée favoriser la colonisation de l'intérieur des terres (GÉROUDET, 1989; OLIOSO, 1996; ANTONIAZZA, 1998; MONNIER, 1998). En France, le Goéland leucophée niche désormais plus ou moins régulièrement à Paris (LE MARECHAL, 1993) ou encore à Toulouse (CADIOU, 1997). En Algérie la nidification à l'intérieur des terres paraît à ses débuts, il n'est pas exclu qu'à l'avenir d'autres localités situées le long des axes des grands oueds soient concernées par ce phénomène.

La présence d'un seul couple nicheur sur la ville de Bejaia et son aspect pionnier ne nous permet pas de généraliser son comportement de reproduction. Son succès de reproduction paraît néanmoins plus élevé qu'en milieu naturel (MOULAI *et al.*, soumis). Ce phénomène a d'ailleurs été constaté par MONAGHAN (1978) et par RAVEN & COULSON (1997). Son alimentation semble dominée par les aliments d'origine anthropique (déchets carnés, déchets de végétaux et aliments divers) provenant de la décharge municipale ou encore des rebuts de marchés. Le percement des sacs à ordures, phénomène relativement répandu en Europe (VINCENT, 1988, DUHEM & SUEHS, 2001) n'a pas été observé à Béjaia mais plusieurs goélands leucophées ont été observés montrant ce comportement dans la ville balnéaire d'Aïn turk située à 14 km à l'Ouest d'Oran. Des cas similaires nous sont rapportés à Jijel (N. RAMDANE et O. KISSERLI, comm. pers.). La prédation à l'encontre des espèces animales présentes dans l'environnement urbain n'est pas négligeable. Les Goélands leucophées s'attaquent ainsi au Pigeon biset, au Martinet pâle et même au Rat

surmulot. La consommation de ces espèces a déjà été rapportée par VINCENT & GUIGUEN (1989) pour le Pigeon biset, GORY & ANDRÉ (1997) pour les martinets et BEAUBRUN (1988) pour le Surmulot.

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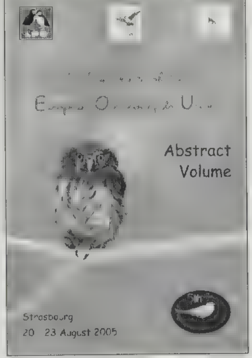
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Mohammad Kaboli, Mansour Aliabadian, Lauren Cornwallis & Roger Prodon

The 5th Conference of the European Ornithologists' Union (E.O.U.)

FOREWORD

In front of you are the abstracts for the 5th biannual congress of the European Ornithological Union. In the process of putting together the programme and, lightly, editing the abstracts, my colleagues in the scientific programme committee and I are in the priviliged position of having read all of them several times. The three major aims of these congresses are definitely being achieved. The first aim of being the platform where European scientists working with birds meet is reflected in the geographical spread of the authors and in the range of topics addressed. The second aim of encouraging young scientists to participate is also being achieved. The third aim of being the platform for exchange of information between basic science and more applied aspects, particularly in conservation is clearly reflected in the programme.

Parallel sessions are necessary to prevent the congress of becoming far too long. I will have great problems in deciding which session to follow at each moment. There are quite some new developments in many areas and I can hardly wait to see and hear all the details that the abstracts promise.

Arie J van NOORDWIJK

PLENARY ABSTRACTS

HOW PENGUINS COPE WITH COLD AND LACK OF FOOD

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In order to predict the impact of global change on birds, it is obviously essential to understand how they are able to adapt to climatic changes and to know the impact of these changes on their resources. In recent years, we have learnt much on this subject for Antarctic penguins, thanks to the development of a multidisciplinary approach.

To first understand how penguins are able to cope with climatic conditions, it is very useful to address this question from an evolutionary perspective. Indeed, the ancestors of the present penguin species lived at the temperate or subtropical latitudes of Australia and New Zealand (SIMPSON, 1976). Today, living penguins are distributed in the Southern hemisphere between the coasts of the Antarctic continent and the Galapagos archipelago. Those species which colonized the Antarctic area therefore correspond to the most advanced stage in evolution considering adaptation to cold. In particular, the Emperor Penguin is the only animal to breed in the middle of the severe Antarctic winter. Thus, to determine which factors have been decisive in its adaptation to cold, we may compare the Emperor Penguin with its closest relative, the King Penguin which lives and breed in the more temperate subantarctic area.

But to elucidate how penguins deal with cold, it is also important to take into account that Antarctic penguins are alternatively foraging at sea and fasting ashore in the cold in order to breed or moult. Thus, the question is not only how they are withstanding cold but also how they spare energy despite being in the cold. As a first step, we have shown that Emperor Penguins are able to keep up at their minimum level of energy expenditure for ambient temperatures as low as -10 °C (LE MAHO *et al.*, 1976). However, the ambient temperature may decrease to -30 °C in the colonies located at about 65° S and to between -40°C and -50 °C in those colonies at higher latitudes. Already the pioneers in the study of Emperor Penguins (see PRÉVOST, 1961) understood that their huddling behaviour, which is not observed in King Penguins, is the key for their survival and success in breeding. Using stable isotopes, we have demonstrated that huddling Emperor Penguins do better than avoiding any increase in their metabolic rate below a temperature of -10 °C. Indeed, they are able to reach a metabolic rate which is 25% lower than the minimum metabolic rate of a non huddling bird (ANCEL *et al.*, 1997). Without huddling, male Emperor Penguins which fast for about 4 months for pairing and incubation, would only be able to fast for 2 months and therefore fail in breeding.

Living in the cold and being able to cope with it is the key for Emperor Penguin populations to be maintained, since the drop which occurred in their population at Pointe Géologie colony in Adélie Land around 1975 seems to be due to warmer years and a lower extent of sea ice at the beginning of the seventies. Since then, the population has been fluctuating. It decreases when the sea is warmer and the extent of sea ice is lower due to an effect of the El Niño Southern Oscillation (ENSO) in the Southern Ocean. It increases during colder years (BARBRAUD & WEIMERSKIRCH, 2001). The reason is that production of krill, the main prey for Emperor Penguins, is declining when the extent of sea ice is lower.

Although, King Penguins do not face cold temperatures when breeding, they have to cope with a seasonal and interannual variation in the abundance and localization of their prey.

But this was only demonstrated recently, thanks to the tremendous development in microelectronics and microcomputers, as well as in space technology. This has resulted in our ability today to equip free ranging penguins with different kinds of miniaturised instruments. The so-called loggers enable to get data on their behaviour or

physiology or on their environment, and to store them. Satellite transmitters, i.e. Argos or GPS, or radio transmitters are also used for the localization of the birds. Using pit tags with antennas on the passageways of the birds at their colony, it has been made possible to make an automatic identification of many individuals and, using an electronic scale, to weigh them and therefore know how much food and body fuels are accumulated when they come back from foraging at sea.

Heart rate and regional body temperatures can be monitored on penguins going far at sea, which brings new light on the physiological adjustments related to long-term apnoea, i.e. a key to pursue prey at depths. Movements of jaws or changes in oesophagus temperature may be recorded in penguins foraging at depths, these being monitored as well as the components of the displacements of the birds into water, i.e. speed, acceleration, flipper beats and water temperature (See NAITO, 2004). Using these new methods, we have for example shown that breeding King Penguins from Possession Island in Crozet Archipelago essentially forage at the Polar Front where they find their main prey, Myctophid fish. We have also shown that the so-called Circumpolar Wave events (WHITE & PETERSON, 1996), which are related to the El Niño Southern Oscillation (ENSO), may result in the distance between the colony of King Penguins and the front to be increased from about 400 to 600 km. However, both male and female of King Penguins are alternatively incubating the egg and the male is usually assuming the last shift of the incubation. Accordingly, the female is usually coming back from the sea at the time of hatching. In "warm years" however, with the Polar Front at a greater distance, she may be delayed. We have then found that the male has kept food in his stomach when coming ashore for assuming the last shift, which lasts on average for about three weeks. This food is conserved and it enables the male to feed the newly hatched chick for ten days if the female is delayed (GAUTHIER-CLERC *et al.*, 2000). Using data loggers, we have shown that the stomach temperature is unchanged in those birds conserving food, i.e. being still maintained at about 38 °C. But the pH is increased, which explains the conservation of proteins and stomach motility is decreased, again in accordance with food conservation (THOUZEAU *et al.*, 2004).

Without other tools, we would have been unable to proceed further in our understanding. Using microbiology techniques, we discovered that the bacteria in King Penguin's stomach were not killed but in a kind of hibernating state (THOUZEAU *et al.*, 2003a), which suggested the secretion in the stomach of a substance with antibacterial activity. Using high performance chromatography, mass spectrometry and sequencing, we have then identified a peptide (THOUZEAU *et al.*, 2003b) of which we also determined the three-dimensional structure (LANDAU *et al.*, 2004). We called it "Spheniscine" and the molecule that was prepared by bio technology according to its structure revealed to have a strong antibacterial and antifungal activity. In particular, it is very active against *Aspergillus fungus*, which is responsible of a severe lung disease in humans and animals (THOUZEAU *et al.*, 2003b). Thus, elucidating physiological adaptations of Antarctic birds to the impairment of their resources due to climatic changes may result in findings of biomedical interest. But again, the tools of various scientific communities may be required.

Thus, food conservation in parent's stomach enables the survival of the chick if the mate foraging at sea is delayed. But what happens if the mate at sea does not show up when the body fuel stores of the parent ashore are reaching a critical stage? Penguins never starve to death in their colony. To survive, they need to walk over 130 to 150 km on sea ice before reaching polynias, i.e. open areas into the ice, in order to refeed (ANCEL *et al.*, 1992). Using molecular tools in laboratory animal models which mimic the body condition of abandoning penguins, we found that neuropeptides that are known to stimulate hunger are then produced (BERTILE *et al.*, 2003). Thus the penguin is then probably abandoning because becoming increasingly hungry. Still using a laboratory animal model, we moreover tried to know what is going on with the intestine in relation to its well known atrophy during a long fast. We then found that the intestine starts to be restored at the same time the neuropeptide stimulates search for food (HABOLD *et al.*, 2004).

In conclusion therefore, investigating how penguins cope with climatic changes and the

impact of these changes on their resources, we have elucidated physiological mechanisms that are involved in the trade-off between the success in breeding and in the preservation of the survival of the parent in birds. Some of these mechanisms, such as food conservation in penguin stomach, may also exist in other marine birds. The signal which triggers refeeding before it is too late when body fuels are close to be depleted is presumably a general safety mechanism for many wild animals and our goal is now to elucidate how it works.

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ECOLOGICAL MECHANISMS OF SELECTION: RADIO-TRACKING AND APPROACHES TO MISSING LINKS BETWEEN ECOLOGY AND EVOLUTION

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Estimates of life-time reproduction of birds indicate that most recruits into the breeding population are produced by a relatively small proportion of the preceding generation (overview in

NEWTON, 1989). This suggests that differences in adult reproductive performance and differential juvenile survival may result in powerful selection processes

There is a large record of research on the factors that determine reproductive ouput and offspring quality. In contrast, the mortality of juveniles and adults (as the counterpart of production) is much less explored. The pivotal mechanisms of differential survival and thus, selection in relation to reproductive traits, are poorly understood because they operate after fledging, when individuals are hardly accessible for measurement and experimentation.

New methodological and technical tools now allow these important problems to be investigated. I discuss advances in the fields of population genetics, population dynamics and behavioural ecology that, in combination, provide new and surprising views into the ecological mechanisms of life-history evolution. The example species are the Great Tit and the Barn Swallow.

New discoveries in the field of population dynamics and genetics indicate that the gene flow within a population is non-random and thus affects the local genetical structure and drives small-scale evolutionary processes. Long-term data on the great tit population of Wytham woods (GB) allowed the pedigrees of many individuals to be analysed over many generations (GARANT *et al.*, 2004, 2005). This yielded accurate estimates of the heritability of major life-history traits and proof for consistent directional selection. However, reproductive traits (the genetic component of timing of breeding or fledging mass) have been found to vary at a strikingly small spatial scale, probably in relation to habitat quality. The long-term studies and field experiments on Vlieland (NL) also demonstrate that such small-scale variation in reproductive traits of great tits may be stable over long periods and that these site-specific ‚adaptations' may be very robust against immigration (POSTMA & VAN NOORDWIJK 2005). To explain the ecological mechanisms that form these patterns, investigating the behavioural ecology and survival of individuals beyond the breeding season is indispensable.

Radio-tracking is increasingly used to quantify key parameters of population dynamics such as survival and dispersal. This implies that large samples of animals have to be radio-tagged. New miniature transmitters provide access to analyse the ecological and behavioural processes that determine the survival of juvenile Great Tits and Barn Swallows after fledging. The significant finding here is that the real bottleneck of reproduction comes after fledging of the brood. The parent birds experience the rewards or retributions of their reproductive decisions in the period from fledging to the break-up of the family. The post fledging mortality of juveniles is enormous and highly selective. In both Great Tits and Barn Swallows there is strong selection for the timing of breeding and high fledging mass during the post-fledging period. Predator-prey relationships appear to be the major selective process, operating strikingly efficient. The immediate cause of mortality is almost invariably predation. However, low food availability or poor foraging performance are secondary factors of differential survival. The radio-tracking studies demonstrate in which phase of the life cycle and by which ecological factors selection operates, and thus, give insight into the proximate mechanisms that select for timing of breeding and fledging mass. Spatial variation in these ecological factors is thus probably a main component of the small-scale spatial variation in selection differentials that was observed at the level of population genetics

Furthemore, the range use of juvenile birds in the post-fledging period varies markedly in relation to the chicks' physical condition. This also supports the findings at the level of population dynamics and suggests that differences in the physical condition, and probably also in the behaviour of juveniles (e g. VERBEEK *et al.*, 1999) may affect the dispersal and in turn the gene flow and the small-scale variation in the genetic structure of a population.

In conclusion, the emerging links between population dynamics, genetics and behavioural ecology challenge the view that evolutionary processes are slow and function at relatively large spatial scales. At least in the example species, selection strikes quickly and with stunning efficiency In addition, behavioural processes such as dispersal within a population appear to reinforce the selection process rather than to randomise the genetic basis. Thus nano-evolutionary processes

may allow for a swift modification (may be adaptation?) of traits in response to variation in ecological conditions.

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PECULIARITIES OF DISTRIBUTION AND PATHOGENICITY OF AVIAN MALARIA PARASITES AND OTHER RELATED *HAEMATOZOA*

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For a long time avian malaria parasites of the genus *Plasmodium* and their close relatives of the genera *Haemoproteus* and *Leucocytozoon* (*Sporozoa, Haemosporida*) have been used as models to study human malaria, and therefore became objects of intensive investigation. Avian haemosporidians as models for research into human disease were largely replaced by the discovery of malaria parasites of rodents and then by the development of culture techniques in the second half of the 20th century. Unfortunately, these developments have markedly reduced the number of investigations of this group of bird parasites. The great body of knowledge remained, however, so that when ecologists and evolutionary biologists sought models to illustrate their theories, avian haemosporidians provided some of the best existing databases to study more general topics. Examples include the role of parasites in natural populations and conservation projects, and the importance of parasites in ecology and evolutionary biology of their avian hosts (HAMILTON, 2001; VALKIŪNAS, 2005).

Avian malaria parasites and other haemosporidians fulfil many of the specifications of an ideal model for the study of the effects of parasites on natural populations. They are widespread, abundant, diverse, and are easily sampled without disruption of the host population. In addition, they show a diversity of pathogenic potential, which is still insufficiently investigated in wildlife. However, the investigations have also presented potential theoretical pitfalls because of complicated life histories of the haematozoa, the epidemiology of the diseases, and the migratory behaviour of their avian hosts. The main aim of this paper is to highlight some important aspects of the ecology of avian malaria parasites and their close relatives that await future research in ornithology, parasitology and evolutionary biology. This information could be helpful in indicating some general directions for future investigations on host-parasite relationships.

It is worth nothing that malaria parasites and other haemosporidians are widespread in the tropics and subtropics where they parasitize amphibians, reptiles, birds, and mammals. In the central and northern Palearctic region, with a few exceptions in bats, they are absent from all groups of vertebrate animals except, strikingly, the birds. The fauna of avian haemosporidians extends to high latitudes of the Northern Hemisphere, where active transmission occurs. Some species of *Leucocytozoon* are transmitted even far beyond the North Polar Circle, which is a unique situation for haemosporidians. The regular seasonal bird migrations to the subtropics and tropics contributed to the distribution of avian blood parasites in the Palearctic. In an evolutionary sense, this process

was rapid because avian haemosporidians exist and are transmitted today in regions of the Palearctic which were covered by ice during the last ice-age as recently as approximately 10,000 years ago. Thus, the rapidly evolving and expanding avian malaria parasites and other haemosporidians can be used as convenient models to study the evolution of emerging diseases, which currently constitute an alarming health problem

Interestingly, the most ancient and relatively primitive groups of birds either do not have haemosporidians or these parasites are scarce in them and clearly have a secondary origin. For example, the total number of species of haemosporidians found in birds belonging to the Sphenisciformes, Struthioniformes, Rheiformes, Casuariiformes, Apterygiformes, Tinamiformes, Gaviiformes, Podicipediformes, Procellariiformes, and Pelecaniformes is equal to nine only, or 4% of the total avian haemosporidian world fauna On the other hand, the maximum species diversity of all groups of haemosporidians is recorded in the birds which are evolutionarily the most recent. For example, 86 species of haemosporidians, 42% of the total fauna, have been described in passeriform birds. This demonstrates the possibility of relatively quick evolution of haemosporidian species in recent, flourishing groups of birds.

Molecular genetics provides inexhaustible opportunities for investigations into the host parasite relationships, including those of avian haemosporidians (BENSCH, 2005). Microscopical examination of blood films underestimates the prevalence of haemosporidian infections, especially of *Plasmodium* spp and, to a lesser extent, *Haemoproteus* and *Leucocytozoon* spp., but it is still the best method to record the diversity of species of these parasites in each individual avian host. The current PCR methods underestimate simultaneous multiple infections of haemosporidian parasites in naturally infected birds. The amplification is often highly selective in multiple haemosporidian infections. Specific primers for *Haemoproteus* and *Plasmodium* spp. have still not been developed. A combination of approaches of microscopy and PCR based methods is important for studies on the ecology and evolutionary biology of avian haematozoa (VALKIŪNAS *et al.*, 2005) Pathogenicity of avian haemosporidians is mainly due to (i) the damage caused by the parasites in various organs and tissues and (ii) the blood pathology resulting from direct and indirect destruction of blood cells and the resulting anaemia In each genus and subgenus of haemosporidians, there are species which differ markedly in their virulence to avian hosts. It is important to note that haemosporidian infections, which are all transmitted by blood sucking dipterans (*Insecta, Diptera*), frequently kill the insects and thus play a complicated role in natural ecosystems, which is still insufficiently investigated in wildlife.

Devastating epizootics of bird haemosporidioses occur in wildlife, but they have been rarely recorded and are usually associated with infections in new avian hosts The enormous genetic diversity of avian haemosporidians (BENSCH, 2005), and thus the high probability that certain lineages of parasites will infect new hosts, indicate that the role of blood parasites in bird populations is likely to be underestimated (VALKIŪNAS, 2005) The available data allow us to state that the influence of haemosporidians on wild birds is usually manifested by decreasing the competitive ability of infected individuals during an acute (usually short-lasting) stage of initial development of the parasites. Because of the high prevalence of haemosporidians in the majority of Europeans bird populations, the influence of the parasites on avian hosts can be considerable, but the details of the host-parasite relationships remain poorly understood. Infections in new hosts can be especially dangerous because the change of host is frequently associated with increase in virulence and even atypical development of the infection. This phenomenon has been insufficiently investigated, especially in wildlife. It is noteworthy that heavily infected birds are inactive during the acute stage of infection and thus are not readily available for researchers using traditional sampling methods (mist nets, traps, *etc*). To measure the real impact of parasites on wild birds, special methods of investigation should be designed These methods must allow the observer to follow the fate of birds during the acute stage of initial infection. Ideally, field studies should be supplemented by experimental work

To stimulate the progress in ecology and evolutionary biology using avian haemosporidian parasites as models, joint projects on parasitology,

ornithology and evolutionary biology are to be recommended. The participation of parasitologists is important not only during investigation of blood samples and identification of species of parasites (as is usually the case), but also during planning and data analysis. This would reduce the possibility of epizootiological mistakes occurring in studies using avian blood parasites as models in ecology and evolutionary biology.

I am grateful to the staff of the Rybachy Biological Station for the provision of excellent opportunities to carry out research on avian haematozoa at the Station in 1977-2004. I gratefully acknowledge the help in the field and ornithological advice provided by all the staff at the Biological Station. I am grateful to John R. BAKER for comments on an early draft of the paper. This study was supported in part by the Lithuanian State Science and Studies Foundation.

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INADVERTENT SOCIAL INFORMATION AND DECISION-MAKING IN BIRDS: A NEW PARADIGM FOR EUROPEAN ORNITHOLOGY

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Like every animal, birds are often facing alternatives leading to different fitness outcomes. Such differential fitness implications generate high selective pressures favoring the evolution of sophisticated decision-making processes. Actively selecting among alternatives involves the gathering of information about those alternatives. The question of the nature, availability and implications of the various potential sources of information is thus central to Behavioral Ecology. Information can be gathered from a vast array of cues and signals that reduce uncertainty about the current environmental state, potentially allowing a more adaptive response. A recent discovery in Behavioral Ecology is that animals often use information inadvertently produced by the activity of other animals sharing similar ecological requirements. Indeed, the activity of animals inadvertently produces a lot of valuable information about the current state of the environment, a kind of social information that as been called Inadvertent Social Information (ISI,). A particularly well studied form of ISI is Public Information (PI;), that is information extracted from the performance of others. Indeed, animal performance directly reflects the interplay between the physical, biological and social components of the environment. Furthermore, PI and ISI use has also been experimentally demonstrated among heterospecifics within mixed species social groups.

In terms of the types of decisions involved, ISI use has been demonstrated both in a natural and sexual selection context. Concerning natural selection, ISI is used in various situations belonging to optimal foraging, breeding habitat selection, detection of danger and intraspecific brood parasitism. In the sexual selection context PI use was demonstrated in various aspects of mate choice and may lead to mate choice copying and eavesdropping. For the moment, the use of ISI mainly involves vertebrates but has also been suggested in plants. Among vertebrates, birds certainly constitute one of the two most important taxa for the demonstration

of ISI use I will review the evidence for the use of information inadvertently produced by the behavior of con- and heterospecifics while purposely selecting bird examples every time this is possible. My goal is to show the central importance of ISI in many decision-making processes in birds and animals. More generally, I view that new source of information as central to our understanding of the evolution of communication and behavior, with ISI potentially being the platform from which communication may emerge. Furthermore, the understanding of the role of ISI in decision-making is likely to help us predicting the dynamics of many systems, particularly in a Conservation context. Hopefully, this will make a strong case for the development of information-driven approaches of behavior among ornithologists.

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THE PALAEARCTIC-AFROTROPICAL MIGRATION SYSTEM: IS THERE ANYTHING NEW SINCE REG MOREAU?

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Reg Moreau wrote that his now classic work *The Palaearctic-African Migration Systems* (Moreau, 1972) had "started imperceptibly" with an enquiry from David Lack about the habitats utilised by European birds in their African wintering quarters. It turned out to be the culmination of a lifetime's study, the first comprehensive review to consider the ecology of migrants in Africa and how this might determine their winter distributions and migration strategies. This plenary talk covers some of what has been achieved in the decades since Moreau, during which African studies have burgeoned and intermittent reviews have attempted to keep pace (e.g. Curry-Lindahl, 1981, Crick & Jones, 1992; Jones, 1998). We show how accumulating research has in some areas deepened our knowledge of what Moreau had already uncovered. Of course, for many questions that Moreau could only guess at there are still no clear answers, while later workers have posed new questions entirely. Some have not yet been tackled at all in the Palaearctic-Afrotropical system, or at least not in equivalent detail to studies already well-advanced in the Nearctic-Neotropical (Greenberg & Marra, 2005).

Moreau answered Lack's question: in general each species occupies African habitats that most closely resemble their Palaearctic breeding habitats. At the same time he realised that habitats may not remain suitable for the migrants' entire

stay in Africa, forcing them to move on further in mid-winter, a phenomenon he called itinerancy We now know this to be widespread, matching equivalent intra-African migrations by Afrotropical species, which must move for similar reasons. Yet MOREAU was puzzled that many species remain in apparently increasingly inhospitable habitats, especially the Sahel zone, throughout the winter and even manage to fatten there for their return migration in spring. "MOREAU's Paradox", as it came to be known, was partially resolved by MOREAU himself but the extent of resources available to different species, and how they are partitioned, remain to be studied

New technology has helped provide answers to old problems. One of MOREAU's earliest interests had been in the trans-Saharan crossing by migrants, which he asssumed must be accomplished non-stop because no observer had ever found more than a few migrants in any of the Saharan oases. He also thought that a bird cannot know the wind it will meet, so it must be prepared to continue its non-stop journey once committed Radar data now suggest that an intermittent strategy, i.e. flying nocturnally and resting by day, is commonplace, though we still do not know the proportion of migrants overflying at particular points. Radar studies also indicate that birds test winds at different heights and either continue to fly or land if they are unfavourable MOREAU's most often-quoted guess, that c 5 billion birds annually make the Saharan crossing, has also been tested with radar data, and survives the test For small birds we still do not know their migration routes in detail, though satellite tracking data, unimagined by MOREAU, are now available for storks and raptors, showing their exact routes, stopover sites, daily progress and the time allocated to migration and resting. Much better theoretical models more accurately estimate flight ranges of migrants, and in some cases suggest that lengthy detours around the desert may be more advantageous than direct flights across it.

The answers to some questions eluded MOREAU and elude us still. We know almost nothing at all about the routes, fattening and stopover points of itinerants on their mid-winter intra-African journeys, nor where many spring migrants refuel. The wintering distributions in Africa of different breeding populations are barely known, despite its importance for conservation efforts as large scale ecological changes take place both in Europe and Africa. Besides satellite transmitters, new techniques such as stable isotope analysis have the potential to reveal patterns not discernable from the scanty ringing recoveries in sub-Saharan Africa. MOREAU pointed out that migrants may be astonishingly site-faithful to the same wintering area year after year, and many are territorial. Yet the fitness consequences of habitat choice, site-faithfulness and territoriality in terms of individual return and survival rates remain virtually unknown and unstudied in the Palaearctic-African system, in contrast to the Nearctic-Neotropical Some life history parameters appear to have been flexible under selection, however, such as when and where to moult, while experiments have shown that some evolutionary adjustments can be very fast, with changes of migratory behaviour potentially being selected for within very few generations There are still very few physiological studies of migrants in Africa, so we cannot properly assess the 'physiological advantage' that MOREAU thought might benefit migrants due to wintering in a more favourable thermal environment Finally, for MOREAU it was "...difficult to imagine how... competition can be avoided" between Palaearctic immigrants and Afrotropical residents Recent studies provide only equivocal answers, perhaps depending on what is looked for and which parameters are measured

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SYMPOSIUM ABSTRACTS

PARALLEL SESSION A 1

ENVIRONMENTAL CHANGE AND ECOLOGICAL TRAPS

INTRODUCTION

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Birds often rely on indirect cues from their environment to match life-history or behavioural decisions with favourable habitat conditions. Environmental change can lead to a dissociation between these initial cues and the selective environment under which a decision used to be adaptive. For example, timing of breeding based on photoperiodic stimuli may no longer coincide with temperature-dependent emergence of invertebrate prey used for rearing young. Maladaptive responses to formerly reliable cues drive species and populations into ecological or evolutionary traps, despite the availability of higher quality alternatives (SCHLAEPFER *et al.* 2002 Trends in Ecology and Evolution 17: 474-480). Behavioural plasticity may be one way to escape an ecological trap. However, adaptability to long-lasting environmental changes – in particular those associated with global warming – will depend on whether plastic responses to changing conditions are in accord with genetic (evolutionary) influences. This symposium aims at drawing together studies on recent changes in avian life-histories, behaviour and distribution with information about potential ecological and evolutionary traps that birds are heading for.

CAUSES AND CONSEQUENCES OF INCREASINGLY LATE BREEDING IN NORTH SEA SEABIRDS

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Birds often rely on environmental cues to prepare for breeding and lay their eggs at the right time. If these cues are not directly linked to food supply, they may become unreliable under climate change and lead to a mismatch between energy supply and demand. While most terrestrial birds breed earlier now than previously, some seabirds have shown the opposite trend. We examined relationships between timing of breeding and environmental cues in North Sea seabirds. In a resident species (European Shag *Phalacrocorax aristotelis*), timing was weakly correlated with local sea surface temperature, whereas two migratory species (Black-legged Kittiwake *Rissa tridactyla* and Common Guillemot *Uria aalge*) showed correlations with a large-scale climatic index, the NAO. The latter two species also tended to breed later in more recent years. The phenology of the main prey, the Lesser Sandeel *Ammodytes marinus*, was examined using data from the Continuous Plankton Recorder survey, and we found evidence that hatching of sandeel larvae has become later over a 30-year period, and that later breeding of guillemots and Razorbills *Alca torda* was linked to the delayed occurrence of 0-group sandeels. However, guillemots rely on older sandeels, which bury and become unavailable in early summer, for successful breeding. If older sandeels haven't changed their annual cycle in tandem with 0-groups, this could lead to a decline in food availability at a critical stage of the breeding season, which could again be linked to the observed decline in breeding success for this species.

NON-IDEAL HABITAT SELECTION: ARE WHEATEARS DOING THE BEST OF A BAD JOB?

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Breeding habitat selection is expected to strongly affect individual fitness in heterogeneous habitats. Breeding habitat selection should, therefore, ideally be based on cues closely reflecting habitat quality and thus predicting realized individual fitness in the habitat. Using a long-term population study of Northern Wheatears (*Œnanthe œnanthe*) in a farmland landscape with spatially and temporally variable habitats we examine whether territory choice was linked to predictors of breeding success. Long-term occupancy of territories did not predict probability of breeding success in a given year; neither did territory clustering or previous year's presence or breeding success of wheatears. Only territory field layer height predicted probability of breeding success in a given year. Contrary to expectations, wheatears did not prefer territories with a short field layer but instead preferred to settle in territories which had been frequently occupied. Thus, there was a mismatch between predictors of habitat quality and the observed preferences causing attractive territories to be, on average, no better than less attractive ones. We conclude that this mismatch was, as compared to ecological traps, a more general case of non-ideal habitat selection. Non-ideal habitat selection was most likely caused by recent landscape changes, creating constraints for cues used when assessing territory quality. Such deviations from ideal habitat selection may be rather common in anthropogenic landscapes and affect population dynamics.

POOR CHOICE OF BREEDING HABITAT BY RED-NECKED GREBES AT FISH PONDS

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Common Carp (*Cyprinus carpio*) ponds provide the prime breeding habitat for Red-necked Grebes (*Podiceps grisegena*) in Central Europe. Between 1993 and 2004, I studied the choice of breeding sites and the reproductive successes of grebes in relation to the age of the carp stocked in fishponds in SE Poland. The reproductive success of birds nesting in ponds stocked with the youngest fish (fry) was high, whereas pairs in ponds stocked with one year old (1+) - or older - carp suffered serious chick losses due to food shortages, in that over 1/3 of them were faced with total brood failure. Unexpectedly, early breeding pairs preferred ponds with 1+ fish, apparently deluded by the rich fish supply. Behavioural observations showed that fish formed a substantial part of prey provided to the flightless young. However, grebes are gape-limited predators and the range of fish which they are able to eat is limited to small bodied fish. One-year old carp are too large to be swallowed by the chicks and the rapid growth of cultured fish also makes them unavailable for the adult birds in the later stages of the breeding season. Moreover, the numbers and the biomass of aquatic macroinvertebrates and tadpoles, the alternative prey to fish, were markedly smaller in ponds with older carp than in those stocked with fry. Most of the late nesting pairs (mainly replacement clutches) established territories in fry ponds. The poor habitat forecasting by the early breeding pairs may have demographic consequences for grebe populations since the early nesters are presumably the highest quality breeders.

TIMING OF BREEDING AND COMPETITIVE RELATIONSHIPS OF SEDENTARY AND MIGRATORY BIRD SPECIES UNDER CLIMATIC FLUCTUATION

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Timing of breeding is important for birds' breeding success. Food supply usually has a quantitative or qualitative peak which the greatest need for food for nestlings should meet. It has been suggested that climatic change causes more difficulties for long-distance migrants than for sedentary species, because they are not able to predict the phenological advancement in their breeding environments. Changes of breeding dates in hole-breeding species may lead to changes in the strength of competition over nest-holes. We studied the timing of breeding and competition between resident Great Tit (*Parus major*) and trans-Saharan migrant Pied Flycatcher (*Ficedula hypoleuca*) in a half-century-long time series from SW-Finland. Both species bred earlier in spring when the breeding area temperatures of species-specific sensitive periods were higher. In spite of this, both species' breeding periods were delayed in relation to both, temperature and environmental phenology. We describe probability of competition by the difference between the species' median laying dates, by a breeding period overlap measure and by numbers of observed conflict events. There was a lot of year-to-year variation in all three variables, but no evidence of long-term trends. The difference between the temperatures of the species-specific periods explained the difference of the laying date medians, but had no effect on the other two variables. There was no evidence for different abilities of sedentary and migratory species to cope with climatic fluctuation.

DOES CLIMATE CHANGE AFFECT AVIAN PROTANDRY?

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Current climate change has already affected the timing of life history events of birds, such as the timing of spring migration. One possible detrimental effect of climate change could be a change in the difference between spring migration timing of males and females. Changes could for example disrupt the timing of breeding in relation to the peak of food abundance, and thus significantly affect breeding success. In the present study, we explore whether the time-lag between male and female spring arrival has changed during a period of climatic warming. Drawing on phenological data collected at three Northern European trapping localities, we investigate whether the degree of protandry in four sexually dichromatic songbird species has changed over time. Furthermore, we analyse whether sex-specific migration dates and changes in relative arrival timing are influenced by climatic conditions *en route*.

PARALLEL SESSION A 2

FORAGING ECOLOGY OF SEABIRDS

INTRODUCTION

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In the past, the foraging ecology of seabirds have been particularly elusive to study given the difficulties to study birds in a pelagic environment, and most studies were based on dietary analyses and unstandard survey vessels Nowadays, the combination of traditional approaches with electronic devices as well as stable isotopes, lipids and contaminant analyses are revolutionising our understanding of the foraging ecology of seabirds Distribution of seabirds at sea is now studied from survey vessels using standardized methods Detailed movements and activity of seabirds at sea can be studied by deploying a sort of devices such as satellite transmitters, GPS, light level geolocators or temperature sensors among other instruments Distribution and movements at sea can now be related to oceanographic features obtained from ship surveys, buoys or remote sensing satellites, and treated in a GIS environment Stable isotopes, contaminants and lipid analyses can also be used to study diet avoiding the biases of the traditional methods as well as to help locating foraging grounds In summary, this session will include presentations of new data on the spatial and temporal relationships between seabird movement or abundance and sea surface features, food availability and overlap with fisheries.

THE EVOLUTION OF FORAGING BEHAVIOUR IN CONTRASTED ENVIRONMENTAL CONDITIONS

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Marine predators live in an environment that is patchy and hierarchical. They adjust their foraging behaviour to this structure. The morphological adaptations and movement patterns are the products of long-term selection for specific traits, but foraging is also partly the result of learning. Since environment productivity and structure vary extensively, they should have led to specific morphological and behavioural adaptations for foraging. Here I compare the morphological and foraging strategies of marine predators in two contrasted environments, tropical waters where productivity is low and the environment less structured, and sub polar region where productivity is higher and particular enhanced in specific zones such as fronts or shelf edges. I examine how communities, and in particular how foraging strategies differ in seabirds between these two environments

STABLE ISOTOPES AND LIPIDS AS TROPHIC MARKERS TO INVESTIGATE THE FEEDING ECOLOGY OF SEABIRDS

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Our knowledge on the feeding ecology of seabirds is largely restricted to the breeding period. For example, seabird food is generally known from the prey brought back by the adults to feed their chicks. To overcome this poor temporal integration, two indirect methods are increasingly used, stable isotopes and lipid analysis, to investigate trophic relationships of seabirds and their spatio-temporal changes in various marine environments. Stable isotopes of carbon ($^{13}C/^{12}C$) and nitrogen ($^{15}N/^{14}N$) allow the

determination of foraging areas and trophic levels, respectively, and they can be measured on blood and feathers that can be sampled non-destructively in the field Lipid composition of stomach oil of procellariiforms has the potential to determine prey species consumed when adult birds are far away their breeding colonies. This brief overview will focuse on birds from the Southern Ocean and the following points. first, the feeding ecology of breeding adults when they forage for themselves, not for their chicks, during and outside the breeding period, second, the feeding ecology of pre-molting adults and immature birds, for which almost no information is available, and finally, resource partitioning at the community level. The results underline seasonal differences in foraging areas, and they emphasize species dietary specialisation and individual foraging strategies The stable isotope and lipid techniques thus appear to have different fruitful fields of application to the study of seabirds from the Southern Ocean and elsewhere.

THE IMPACT OF FORAGING CONSTRAINTS ON SEABIRD POPULATION DYNAMICS. A CASE STUDY IN CAPE GANNETS *Morus capensis*.

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Environmental constraints shape the foraging strategies of predators, which widely condition their survival and reproductive output. Although such processes are assumed to rule the population dynamics of seabirds, little is known about the actual links between environmental conditions, the foraging tactics of individual birds, and population processes. Cape Gannets (*Morus capensis*) are endemic to southern Africa, breeding on six inshore islands Interestingly, smaller colonies have lower growth rates, suggesting that extrinsic factors override density-dependant effects. To test this hypothesis we studied the foraging behaviour of 145 individuals from the five Cape Gannet colonies on the west coast of southern Africa using GPS data loggers, time-depth recorders, and direct observations. These recordings provided information about the foraging efficiency and the foraging distribution of birds from the different colonies. We tested potential links between these variables, the bathymetry of the foraging areas, prevailing winds, sea surface and chlorophyll a levels and the intensity of industrial fisheries. We show that the foraging tactics of Cape Gannets are conditioned by the interrelated effects of bathymetry, wind direction, and primary productivity at the scale of the Benguela ecosystem. However, regional differences in fishing histories and policies affected prey availability and quality, with knock-on effects on Cape Gannet foraging performance and population dynamics.

DIFFERENTIAL FORAGING STRATEGIES AND OFFSHORE HABITAT PREFERENCES OF SEABIRDS FEEDING ON SANDEELS IN THE NORTH SEA

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Sandeels *Ammodytes marinus* are major prey for seabirds in the North Sea Sandeels are principal prey also for pinnipeds, cetaceans and large predatory fish and they are targeted by the industrial fishery in the North Sea. Fishing effort is patchily distributed and there is concern that over-exploitation of stocks has occurred at local spatial scales, influencing the survival and breeding success of top-predators. Results are presented of a

multi-disciplinary EC project (IMPRESS, 2000-04), tackling a specific part of the conflict between natural predators and fisheries. The overall objective was to determine the relationship between sandeel population characteristics, hydrography influencing prey availability, the at sea foraging success and breeding performance of four species of seabirds, as an aid in quantifying possible fishery effects. Seabirds have been studied at-sea and at the breeding colony, and the attempt to combine the two approaches a key objective. Long term data on at sea abundance and habitat usage were combined with long-term colony-based data on breeding population size, vital rates, breeding phenology and diet. Sophisticated bird-borne loggers were deployed in order to collect high quality data on foraging locations and the physical characteristics of these areas. The result were complementary data on foraging behaviour and feeding locations and the results obtained from instrumented individuals will be contrasted against material collected at sea., with emphasis on conspecific and interspecific interactions and prey availability issues

MIGRATION STRATEGIES IN RELATION TO THE POPULATION OF ORIGIN: THE CASE OF CORY'S SHEARWATERS TRACKED BY GLS

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Migration routes and wintering areas of seabirds are generally poorly known, particularly in relation to the population of origin, probably due to the difficulty in recovering rings from open sea Using light level geolocators (GLS), we tracked migration movements over one year of 22 Cory's Shearwaters *Calonectris diomedea*, breeding in three different areas Mediterranean (7), Canary Is. (7) and Azores Is. (8). Most birds clearly migrated following the south, and to a lesser extent, north Atlantic gyres. Wintering grounds of most birds were clearly associated to major coastal upwelling regions, but important differences were found in relation to the population of origin. Most Mediterranean birds *C. d diomedea* spent the winter associated to the Canary current. In contrast, most Canary and Azorean birds *C. d. borealis* spent the winter associated to the Benguela and Agulhas currents, but some birds spent the winter associated to the Brazilian current Differences in wintering areas, regardless of the population of origin, were clearly reflected on the N and C stable isotope signatures of feathers moulted in winter Conversely, differences between Mediterranean and Atlantic breeding populations were reflected in feather heavy metal levels. In summary, this study illustrates that large scale movements of seabirds can be largely driven by dominant winds in order to reach highly productive areas, but also that migration routes and the location of the wintering grounds can greatly differ depending on the population of origin. This study emphasize how seabirds are closely tied to productive waters. These areas were already known as important for fishing fleets. Areas of lowest productivity occurs mainly in the centres af the southern an the northern Atlantic and water tends to circulate around these areas, pushed by major oceanic winds flowing clockwise in the northern hemisfere and anticlockwise in the southern hemisphere. Absence of winds (and phytoplancton) in the centres af the southern an the northern Atlantic was already known by old ships...

PARALLEL SESSION A 3

PROCESSES IN THE PERIPHERY OF BIRD'S DISTRIBUTION AREAS

INTRODUCTION

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The area inhabited by widely distributed species may vary greatly in environmental conditions. Some populations at the periphery can stably maintain themselves in very unpredictable environments, that birds had never experienced living in the centre of the species area. It seems that there are ancestral features, which make birds pre-adapted to unpredictable and harsh environmental conditions, and new characteristics, which evolved in the peripheral populations. Likewise, birds being able to live on the edge are required to redistribute the time and the resources for such expensive stages of their life cycle as migration, breeding and moult. Characters acquired in the periphery inevitably come up against ancestral features in view of maintenance of the species integrity. The strength of gene flow was hypothesised to be responsible for species integrity and relative stability of species distribution borders (MAYR, 1942, 1963). Therefore, processes in the periphery of bird's distribution areas, in our opinion, consist of adaptation to new and unpredictable environments, evolution of life cycles and life strategies, and genetic processes in the populations.

Abstracts to be included in the symposium may deal with one of three main topics:

1. Adaptation to unpredictable conditions and environments in the periphery of species range
2. Evolution of life cycles and life strategies in the environment near species distribution border
3. Genetic peculiarities of the populations, and genetic processes in the periphery of species range

A FLYCATCHER'S VIEW OF PERIPHERY

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In this overview I discuss the importance of peripheral areas for birds. In peripheral areas, such as in northern and alpine environments where the struggle for existence against the physical world is the chief concern of organisms, ecologists have unique opportunities to study the tolerances and limitations of organisms. At the same time the study of peripheral ecosystems may provide ecologists with a deeper understanding of the many aspects of complex central (southern) ecosystems. At the periphery of its distribution area a species is generally more sensitive to the slightest fluctuations of climate and weather than in the central parts of its area. In areas, where species are on such a narrow margin, even a slight warming could be beneficial. Thus, for instance, global warming may cause great changes in the factors which limit peripheral populations. When the effects of physical factors diminish, the effects of biotic factors (intra- and interspecific competition and predation) may play a greater role in the periphery than today.

My own study results are mainly based on long-term (1987-2005) population and breeding data of the Pied Flycatcher *Ficedula hypoleuca* which I have gathered both in northern Finnish Lapland (69°03'N) and northern Norway (69°20'N). These areas lie close to each other (40 km apart) but in very different environments. In spite of the short distance, the Pied Flycatcher populations living in the two areas behave differently. For instance, the size of the breeding populations do not vary in synchrony. There are many factors that determine whether a population is in a "periphery" or not, and sometimes the center may lie in the "periphery". A clear message is borne out of the Pied Flycatcher study: the parameters of neighboring populations may differ from each other more than expected and it is difficult to make generalization of these parameters based on only one or few populations.

ANNUAL CYCLE ADAPTATIONS IN THE PERIPHERY OF THE DISTRIBUTION AREA: FIELD AND EXPERIMENTAL EVIDENCES

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In wide spread species environments can vary greatly within the range. Specific unpredictable and harsh environmental conditions at the peripheral parts of the range are often the main factors, restricting further species spreading. At the same time we are the witnesses of quick contemporary area expansion in many species in Europe. The paper will review results of field and experimental studies of annual cycle adaptations at the periphery of range in birds, evolution of annual cycle in some model species within the range and mechanisms of these transformations. As a rule population stability near the border of range and further area expansion depends on species specific adaptability. To solve the problem of time deficit for breeding, moult and preparation for migration in the areas, where the favourable season is decreased, the complex of adaptations, concerning different parameters of annual cycle, has been evolved in these populations. As a result, distant populations at the periphery of bird ranges can be distinguished by their ecological and physiological features. Stable existence of the species at the range periphery is possible only in case when both adults and juveniles have corresponding adaptations answering the environment requirements. Regularities of annual cycle common for all bird species provide them possibilities to form mechanisms for modification of the timing and duration of seasonal events, even allowing for the exclusion of some of them from the annual cycle by means of photoperiodic reactions in conformity with existing environmental conditions.

STATE OF THE WHITE STORK *Ciconia ciconia* POPULATION IN THE PERIPHERY OF BREEDING RANGE AND EXPANSION TO THE EAST

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White Stork *Ciconia ciconia* expands its breeding range in Europe to the east during last centuries. This process has wave-like pattern: periods of expansion alternate with recoils. The breeding range pulsates and are gradually enlarged. In Ukraine in the second half of XX^{c} century such pulsation went in east regions. There is an interesting contradiction: storks continued advance to the east and its number in these regions increased in spite of total number decreasing of the species and depression of populations in many countries. In other parts of Ukraine population of the White Stork was also in depression at this time. Monitoring of the White Stork population in Ukraine in 1992-2004 allows to explain this phenomenon. We studied breeding success and number dynamics of the species on the net of control plots. It turned out, that breeding success in peripheral part of the range is significantly higher, than in main parts. In west Ukraine the average number of fledged youngs per successful pair makes up (M ± sd) 2.64 ± 0.37, per breeding pair - 2.48±0.21 (n = 175); in south Ukraine: 2.87 ± 0.59 and 2.69±0.64 (n = 30); in north-east Ukraine. 3.21 ± 0.58 and 2.80 ± 0.71 (n = 91), in the Middle Dnieper area: 3.11 ± 0.69 and 2.67±0.65 (n = 129). The highest parameters have Poltava (3.56 ± 0.45 and 3.18 ± 0.58, n = 38) and Kharkiv (3.36 ± 0.51 and 3.06 ± 0.70, n = 10) regions. These figures are also bigger, than in central and west Europe (ZINK 1967; PROFUS 1986, CREUTZ 1988; SCHULZ 1999 ...). Higher breeding success in peripheral parts of stork's range was found also in Russia (e.g. GALCHENKOV 2000). Therefore, in this case the periphery of distribution area is all-sufficient for the further expansion.

CHARACTERIZATION OF MORPHOLOGICAL, ECOPHYSIOLOGICAL AND GENETIC VARIABILITY OF DISTANT POPULATIONS IN THE WHITETHROAT *Sylvia communis*

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The Whitethroat (*Sylvia communis*) is a long distance migrant for which breeding range covers a vast area in Palaearctic from subtropics up to central taiga The aim of the present paper is to provide a characterization of morphological, ecophysiological and genetic variability of distant Whitethroat populations in order to reveal its intraspecific structure and regularities of local adaptations in different parts of the area. Ecological and morphological parameters were studied in 7 points, including populations from the centre and peripheral parts of its range: Caucasus coast of the Black Sea, Low Volga region near Volgograd, Belgorod Region, Ryasan Region, Northwest Russia, West Siberia (Novosibirsk), Tien Shan A total of 102 samples of Whitethroats from six distant localities (five within the breeding area and one in the wintering area in Tsavo, Kenya) were used for DNA analysis. The observed differences in the timing of arrival and breeding, the extent of post breeding and pre breeding moults in birds from the distant breeding regions confirm the presence of local adaptations in geographical populations. At some extent such adaptations can be of the phenotypical character, but there is a strong assumption of their heritable basis. The lack of geographical structure in the variations of the cyt *b* in the Whitethroat can be accounted for by relatively recent extension of their breeding area or by current gene flow. The large distances of thousands of kilometres between populations sharing the same mutations and haplotypes of mtDNA make the last explanation less probable, while the recent expansion of the species is confirmed by multiyear observation data and the considerable individual variability in ecophysiological parameters observed in every population.

PARALLEL SESSION A 4

GENETICS ASPECTS OF VARIATION IN BIRD BEHAVIOUR

INTRODUCTION

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The need for evolutionary studies that integrate the genetic mechanism that underlies variation in quantitative traits is increasing. Due to the complexity, coherence and variability of behavioural traits, evolutionary biologists are more and more attracted to the study of behaviour. Birds are ideal model organisms for this. In this talk we will present the possible methods to study the genetic aspects of avian behaviour, of which several approaches will be presented in this symposium.

GENETICS OF MIGRATORY BEHAVIOUR

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The genetic analysis of avian behaviour has long been a neglected subject. One of the reasons for this is that behavioural traits are often complex and difficult to measure. Moreover, as behaviours are generally expected to be very flexible as consequence of learning, habituation and context-dependent expression, the exact definition of behavioural traits and the conditions of expression are crucial for meaningful quantitative genetic estimates.

In this talk, I shall discuss different approaches for the study of the genetics of avian behaviour, as exemplified in the study of evolutionary genetics of migratory behaviour in the Blackcap (*Sylvia atricapilla*). I will particularly emphasize on the peculiarities of behavioural traits, and discuss potential pitfalls in the estimation of genetic parameters. Furthermore, I shall review recent work on the genetics of avian migration and give a perspective on future studies, including possibilities to study the genetics of migratory behaviour in the wild.

GENETICS OF AVIAN PERSONALITIES

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The extensive knowledge of consistent individual differences in personality traits in the great tit provided a good opportunity to do controlled experiments to unravel the genetic mechanism of avian personality traits. Here I give an overview of the findings of the first genetic study on personality traits in a wild bird. I will discuss what these findings could add to the discussion about the existence and maintenance of genetic variation in personality traits. Additionally, I will put forward some possible next steps for studying the genetic background and its interplay with the environment in natural populations. I will thereby try to point at the importance of using studies that combine both proximate and ultimate approaches to study the evolution of animal personalities.

A GENOME-WIDE SURVEY OF MIGRATION-RELATED GENES IN A SONGBIRD

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Migratory behaviour in songbirds has a strong genetic basis. Several components of this behaviour, such as duration, intensity and migratory direction, are under a very plastic genetic

control that opens the possibility of rapid (10-20 generations) evolutionary changes of migratory habits within a population. We have sought to make a genome-wide survey of gene expression in the Blackcap (*Sylvia atricapilla*) in order to identify genes whose expression may correlate with migratory behaviour. Through a series of subtractive hybridisations, coupled with PCR (Representational difference analysis - RDA), it is possible to identify up- and down-regulated genes differentially expressed between two cDNA populations. During the peak of Blackcap migratory activity, we produced brain cDNA of sedentary (Madeira) and strongly migratory (southern Germany) populations, and performed an RDA consisting of three rounds of increasingly stringent hybridisation conditions (tester: driver ratios of 1: 100, 1: 800, and 1: 10000). In this way, we have isolated over 900 clones that represent more than 600 genes. These have now been spotted into a microarray that will allow us to distinguish between those differences due to intra-population variation and those that represent true inter-population differences, and thus likely candidates to play a role in migratory behaviour

FEMALES OF INTERSPECIFICALLY CROSS-FOSTERED MALES PRODUCED MORE SONS

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Sex allocation theory predicts that parents should manipulate brood sex ratio in order to maximize the combined reproductive value of their progeny. Females mated to high quality males should therefore be expected to produce brood sex ratios biased towards sons, as male offspring would receive a relatively greater advantage from inheritance of their father's characteristics than would female offspring. Through a cross-fostering experiment switching eggs between nests of wild Great Tits (*Parus major*) and Blue Tits (*P. caeruleus*) in a study area near Oslo, Norway, we have manipulated the behaviour of these birds. Cross-fostered birds became subdominant, produced aberrant song and they had problems obtaining mates compared to controls. Hence, sex allocation theory predicts that females of cross-fostered males should have produced more daughters due to the low quality of their mates. However, our results from analyses of sex ratio in 135 broods over the last five years showed no indication of this. Instead there was a tendency for females with cross-fostered males to produce more sons, and for the Blue Tit this was statistically significant. Other potential confounding variables did not explain any bias in sex ratio. We discuss how these males may be perceived as attractive to females despite their, in many ways, aberrant behaviour

SIMILARITY BETWEEN RESTING METABOLIC RATES OF PARENTS AND OFFSPRING IN PIED FLYCATCHER *Ficedula hypoleuca*: HERITABLE OR ENVIRONMENTAL VARIATION?

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Pied Flycatcher fledgling's resting metabolic rate (RMR) was found to be higher in offspring of conspicuous males than in offspring of pale ones (KERIMOV, IVANKINA, 1999) Recent study showed that: (1) this relation was not influenced by variation in fledgling's growth rates; (2) RMR of offspring was positively correlated to basal metabolic rate (BMR) of their fathers (BUSHUEV *et al.*, 2003). To clear the nature of similarity in parent's and offspring's energetics we conducted two cross-fostering experiments exchanging clutches between nests.

In 2003, fledgling's RMR was positively correlated with BMR of their own fathers, and not with BMR of their foster parents, suggesting heri-

table variation in metabolic rate. However, next year experiment didn't support this result. The relation between male colour type and BMR revealed during the latter year was opposite to previously found long-term dependence, according to which BMR of conspicuous males was higher than that of pale ones. Violation of the general pattern in 2004 occurred due to dramatic increase of BMR in pale males that was possibly caused by unusually cold weather during the breeding period. Thus, under certain conditions, the environmental effect of male's BMR variation can completely mask the effect of heritability of energetic traits.

PARALLEL SESSION B1

CONTRIBUTED PAPERS (1)

WHY BIRDS AVOID WOODPECKER-MADE HOLES IN NATURAL FOREST?

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Woodpeckers are commonly regarded as holes producers. Woodpecker-made holes are used by secondary hole-nesters (SHN), i.e. birds and other animals. This is why woodpeckers are often called keystone species On the other hand, there is very little published data on breeding performance of SHN using woodpecker made holes as nest sites In other words, very few comparisons have been made between breeding success of birds nesting in natural (not excavated) tree holes and woodpecker made holes. We analyzed data on seven bird species (*Ficedula albicollis, F. hypoleuca, Sitta europaea, Parus palustris, P. caeruleus, P. major, Sturnus vulgaris*) breeding in natural or woodpecker made holes in primeval stands of the Białowieża National Park (BNP, area protected for around 600 years) Four species (Starling, Nuthatch, Pied and Collared Flycatchers) frequently used woodpecker-made holes. Woodpecker-made holes usually had wider entrances and were shallower and smaller compare to natural holes used by the SHN birds. This could be the reason, why some birds prefer natural holes. Woodpecker-made holes are unsafe for the Collared Flycatchers which is the most common SHN bird in BNP. This contradicts the commonly accepted idea that woodpeckers provide other birds with suitable safe nest sites and demonstrates that under natural conditions in BNP some bird species avoid woodpecker-made holes.

REACTION OF TWO IRRUPTIVE SPECIES TO CLIMATE CHANGE.

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We studied the influence of meteorological parameters in Eurasia throughout the annual cycle on the biology of two irruptive species, Coal Tits *Parus ater* and Long-tailed Tits *Aegithalos caudatus*. Correlation analysis of long-term trapping data (1958-2000) showed a significant relationship between autumn numbers of Coal Tits on the Courish Spit on the Baltic and mean winter air temperatures (December, January and February) in Eurasia. A significant positive relationship of autumn Coal Tit numbers on passage on the Courish Spit with NAOI was found for January and February. In mild winters over a large part of the species' range, significantly more adults survive than in colder winters This increases the numbers of breeding individuals who produce more offspring. We suggest that the bulk of Coal Tits captured on the Courish Spit in irruptive years originate not from the Baltic area, but from the vast

area of European Russia and possibly Western Siberia. In Long tailed Tits first captures in autumn, numbers of trapped birds and duration of passage showed a significant relationship with winter and spring NAOI and spring air temperatures in Eastern Europe. In the years following warm winter and spring in the presumed breeding grounds of Long tailed Tits, earlier autumn migration was recorded in the Baltic area. The earlier passage starts, the more birds are captured in Rybachy-type funnel traps. The regions identified in correlation analysis are likely to be the recruitment areas of both species participating in irruptions, which are also confirmed by recoveries.

FARMLAND BIRDS AND AGRI-ENVIRONMENTAL INDICATORS

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The populations of most farmland birds show a strong decline over the last few decades. This process is still going on and the decline is stronger in Central Europe than it is in Eastern Europe. With the CAP (Common Agricultural Policy) -reform there are chances for positive and with the enlargement of the EU there are risks for negative population developments. In order to maintain or enlarge the populations of farmland birds in whole Europe it is necessary to find out clear figures of agricultural structures that are able to achieve stable populations and to communicate them to the European Commission. There should be conducted a study working out clear indicators both in agricultural sense and in ecological / ornithological sense that support a sustainable agricultural policy. Key indicators in the agricultural sense are for example the size of fields and the crop yields, key indicators for the farmland birds are for example density of territories and breeding success. This study shall be conducted with the help of universities and other partners in several European countries investigating the key indicators of several stable populations of several farmland birds (e.g. *Alauda arvensis* and *Saxicola rubetra*). With a sufficient number of case studies and an involvement of experts of several countries a direct input of scientific results into agricultural policy shall be achieved.

The aim of the contribution will be to present the project idea, to contact potential partners in different countries and to outline the further process in developing the project.

ENERGETIC MAXIMAL ABILITY FOR COMBINE CYCLES OF BREEDING WITH MOLTING IN BREEDING AREA IN MIGRATORY GRANIVOROUS AND ENTOMOPHAGOUS BIRDS OF MODERATE LATITUDES

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The power of consumption from nutrition is limited by capabilities of birds to dissipate heat. These capabilities determine the level of maximum daily power output. This limit is identical both for granivorous and for insectivore birds and equals four basal metabolisms. This power does limit daily energetic cost of molt. Migratory birds have significantly less time for implementation of a breeding and postnuptial molting cycle in the breeding area. The reduction of time for molting in a breeding - molting cycle is possible at the expense of either increase of molting rate (as it takes place in some northern birds), or full elimination of molting from this cycle and shifting it to a later winter time. The duration of breeding-molting period for migratory species is shorter than in nonmigratory birds. That also entails an increase of daily power costs. Migratory species breeding and molting in one cycle need a larger daily power input than do nonmigratory species in that cycle. The energetic cost of molt depends on diet: for granivorous birds they are twice higher than for insectivores. Therefore, granivorous birds should molt longer, but their capability to speed up molting is the same as for insectivores. Therefore, molting during winter or reduction of molting vol

ume occurs much more often among granivorous birds For the species that carry out molting and breeding in one cycle (summer), the energy cost of molt competes with energy cost of breeding It leads to a decrease of energy cost of breeding, that entails reduction of clutch size in granivorous birds The nonmigratory species have more time for a breeding - molting cycle, therefore they usually have a clutch of a bigger size and bigger energy capacity for breeding and molting Thus, the productive energy limits the development of rigid herbivory for birds, especially in temperate and high latitudes. Herbivory and expressed migratory habits are also in competitive relations. For this reasons granivorous birds have such biological phenomena as intermediate migration and breeding in winter Supported by RFBR grant # 03 04 48974

IS HABITAT AND LANDSCAPE STRUCTURE AROUND MID-FIELD SMALL WOOD ISLANDS IMPORTANT FOR THEIR BIRD COMMUNITIES?

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The aim of this study was to recognize relationships between habitat structure around small wood islands and breeding birds occurring in such islands. Goal of the project (1999-02) was to determine the importance of "landscape context" for a better understanding of the mechanisms shaping bird diversity in agricultural landscapes. Habitat structure was quantified on the basis of maps, aerial photographs and field visits for: a) wood islands, b) NN - nearest neighborhood (100 m from wood islands), c) LS – landscape in radius of 1 5 km around wood islands. Bird density was estimated with the aid of mapping a method NN significantly influenced 5 of 18 most common species, of which 3 species were ecotonal. Diversity of NN was the most important feature. It positively affected ecotonal species number and total bird abundance The general pattern of land-use (fragmentation, diversity) was more important than crop plant composition – bird species did not "follow" given crops with respect to applied crop-rotation pattern. The occurrence of 40% of species in wood islands was related to LS structure Typical woodland species were influenced, while ecotonal species were not. Total cover of wood islands, wood proximity index and density of shelterbelts were the most important landscape features positively influencing some species breeding in wood islands, e g. *Turdus merula*, *Parus major*. Total woodland bird species number was also related to features of LS listed above.

The results confirm that landscape context and land-use pattern play a significant role for birds occurring in mid field woodlots

EFFECTS OF FOREST COVER AND FRAGMENTATION ON BREEDING BIRD DIVERSITY: ARE PATTERNS CONSISTENT ACROSS BROAD GEOGRAPHIC SCALES?

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Bird diversity and abundance are likely to be affected by both vegetation structure and landscape structure as well as forest cover In order to assess whether such associations are consistent across broad geographic scales, surveys of breeding birds were carried out using point counts in six 1 km² squares in eight different countries (Finland, France, Hungary, Ireland, Portugal, Scotland, Spain and Switzerland). Within each country, the squares or Land Use Units (LUUs) represented a gradient of land use from mature forest to intensive farmland For each LUU, vegetation surveys were carried out to estimate cover at 6 different canopy height levels and variables describing

landscape structure and forest area were derived from remote sensing. Bird diversity and species richness significantly increased with increasing amount of forest edge and with increasing number of different habitat patch types per LUU. Bird diversity was not associated with vegetation cover or foliage height diversity consistently across countries. Conversely, total bird abundance (all species combined) increased significantly with an increase in mean vegetation cover (at canopy height 0.5-2 m and 4-8 m) and an increase in mean foliage height diversity (F_{HD}), in both cases the rate of increase slowing at higher values of cover/F_{HD}. Forest cover had few significant effects, although bird abundance showed a positive association only when commercial forestry was omitted from the data set All of these associations were consistent across countries indicating general responses of birds to habitat structure at wide geographic scales. These results show that bird diversity and abundance may have differing responses to landscape structure and vegetation structure, but more importantly, show that both horizontal and vertical structure of European landscapes may be more important in determining bird diversity than simple measures of habitat cover.

HOW WELL DO WE KNOW THE FRAGMENTATION EFFECTS – WHY CHIFFCHAFF HAS DISAPPEARED FROM CENTRAL EASTERN FINLAND?

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In order to study effects of fragmentation in boreal forests, we conducted c. 770 km of line transect censuses in spruce-dominated old growth forests at the both sides of Finnish – Russian border at c. 64° - 65°N during June 2002. On the Finnish side of the border, censuses were conducted in old growth forests embedded in the matrix of younger forests whereas on the Russian side, transects were placed in continuous old growth forest. Besides fragmentation level, forests are similar on both sides of the border. The biggest surprise in results was the complete lack of chiffchaffs (*Phylloscopus collybita abietinus*) from the Finnish side, whereas on the Russian side species was fairly common (0.58 pairs/km²). Similar pattern has also been observed in other years. We discuss the different explanations for this result and also in wider perspective, reasons for very different trends of the two chiffchaff subspecies (*P.c.collybita* and *P.c.abietinus*) occurring in northern Europe. Most likely many different factors (predation, competition, habitat changes in wintering areas, climate change, general declining trend of the species etc) act simultaneously causing the observed pattern. This stresses the need to understand also the wider perspective when assessing fragmentation effects. Also, our results suggest that effects of forest fragmentation may be impossible to understand and predict correctly if all underlying mechanisms are not fully known

HABITAT-SPECIFIC WILD BIRD INDICATORS IN THE UK

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Wild bird indicators are increasingly used throughout Europe as measures of wider biodiversity in particular regions or habitats. In this paper, we use bird count and habitat data collected as part of a broad scale volunteer annual survey to explore issues of habitat specialisation and habitat specific trends in widespread bird species in the UK. Data from the BTO/JNCC/RSPB Breeding Bird Survey are analysed to generate measures of specialisation, estimate changes in numbers in different habitats and produce habitat specific multi-species indicators These are compared to widely used categorisations of species to UK landscapes based on expert opinion, and to wild bird indicators derived from these species groupings. Differences in the trends of specialists and generalists suggest that

deterioration in the condition of particular habitats is driving declines of many farmland and woodland species. The more positive trends of many generalist species suggest that declines in some habitats may be compensated by increases elsewhere. This may be due to the fact that many widespread species occur at higher densities in human-dominated landscapes than in farmland or woodland and also appear to be faring better in human-dominated landscapes.

PARALLEL SESSION B2

CONTRIBUTED PAPERS (2)

FINE SCALE FORAGING BEHAVIOUR OF CORMORANTS

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Human activities, like commercial fisheries, produce major changes in the structure of marine food webs. With declining fish stocks prey availability to seabirds and other top predators might be reduced, forcing these species to spend an increased amount of time and energy to locate and capture their prey. A threshold fish density might exist, below which foraging is no longer sustainable in terms of time and energy expended, with knock-on effects for reproductive success and survival. Very little is known about the functional link between prey density and predator performance in the upper trophic levels of marine ecosystems and threshold prey densities are therefore extremely difficult to define. We observed the fine scale foraging behaviour of Double-crested Cormorants (*Phalacrocorax auritus*) foraging on live Rainbow Trout (*Oncorhynchus mykiss*). We experimentally investigated the effect of prey availability, prey size, light conditions, and fish behaviour on cormorant prey capture behaviour. Foraging success of cormorants depended critically on prey availability, with search time increasing and prey capture rate drastically decreasing when fish density was below 2-3 g fish m^{-3}. Fish behaviour (shoaling vs. individual fish) had important consequences for cormorant predatory success. Birds spent an increased amount of time in pursuit when attacking shoaling fish and overall success was significantly reduced. Our results highlight the complexity of predator prey interactions on a fine scale and illustrate the effects of biotic and abiotic factors on seabird foraging tactics and energetics.

HORMONAL CORRELATES OF FORAGING EFFORT IN A PELAGIC SEABIRD

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The ability of individuals to adjust energy expenditure while foraging will determine the amount of resources that can be expended on fitness-related activities. Because a trade-off between foraging costs and investment in reproduction is predicted, understanding physiogical mechanisms governing foraging decision is essential. Amoung them, the hormone Corticosterone deserves attention because of its potential role in foraging activities. However, elevated Corticosterone levels can also induce nest desertion. How

then individuals modulate corticosterone secretion to optimise foraging and reproductive success? In this study, we investigated relationships between corticosterone levels (prior to and after a foraging trip) and precise components of foraging behaviour in incubating Wandering Albatrosses (*Diomedea exulans*) by using satellite tracking and wet-dry activity data loggers. Corticosterone levels decreased during a foraging trip and corticosterone levels reached after a foraging trip were negatively correlated to foraging success. Corticosterone levels prior to a foraging trip were positively correlated to daily distance covered and maximum foraging range, but negatively correlated with the number of landing/take offs. Therefore variations in corticosterone levels below level inducing nest desertion may influence foraging behaviour. A role for corticosterone in mediating foraging decisions is discussed in the context of foraging efficiency (foraging success/energy expended).

A COMPARATIVE APPROACH OF SCALE-DEPENDENT FORAGING MOVEMENTS OF ALBATROSSES

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In a heterogeneous environment like oceans, the movements of foraging predators like seabirds should be adjusted to the hierarchical spatial distribution of resources and scale-dependent search response should differ according to habitats. Using First-Passage Time analysis, we study scales of search effort and habitat used by individuals of seven sympatric Indian Ocean Procellariiform species, to examine whether species and individuals differ in search behaviour according to the marine environment exploited. All species and almost all individuals (84% of 122 individuals) exhibited an Area-Restricted Search (ARS) during foraging. The occurrence and the magnitude of ARS behaviour influence the foraging efficiency, as birds using ARS spent a longer time at sea. Wandering Albatrosses (*Diomedea exulans*) with larger ARS radius had longer foraging trips. ARS scales differed between species and also between habitats with an additive effect. A significant habitat selection occurred according to search effort distribution. This study demonstrated that several seabirds species adjust their foraging behaviour to the heterogeneous environment. In response to this heterogeneity, movement adjustments, depending on both forager and environment characteristics, could influence foraging efficiency. Our results highlight that a scale-dependent approach of movement pattern is needed to understand predators foraging distribution in a heterogeneous environment.

THREE-DIMENSIONAL SPACE USE BY A DIVING SEABIRD: INTERACTIONS WITH MARINE PHYSICS AND LOWER TROPHIC LEVELS

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Oceanography has a profound impact on the distribution of marine life, and top predators are predicted to target areas with a high biomass. However, the impact of ocean physics on top predator foraging dynamics is poorly understood, largely because of the complex trophic linkages involved. We test the prediction that oceanographic processes drive the distribution of marine life from primary production to apex predators in the north-western North Sea. Data were collected from oceanographic moorings, at-sea surveys of primary production and fish distributions, and state-of-the-art data loggers recording location and behaviour attached to an abundant seabird predator in the study area, the Common Guillemot *Uria aalge*. We found that the three dimensional distribution of guillemots was not well predicted by ocean

physics. We highlight two main causes for the mismatch. First, whilst ocean physics is a strong determinant of the distribution of primary production, guillemot distribution matches that of its fish prey (principally Lesser Sandeels *Ammodytes marinus* and Sprats *Sprattus sprattus*), which only dedicate a proportion of the day feeding, spending the majority of time close to the sea floor unassociated with lower trophic levels. This behaviour is presumably an anti-predator strategy. Second, breeding seabirds are central place foragers and thus may have to trade-off habitat profitability with distance from the nest site, such that birds may not always prefer the highest quality areas.

CHANGES IN FORAGING AND MIGRATION STRATEGIES OF GREAT SKUAS

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Ring recovery data suggest that adult Great Skuas *Stercorarius skua* winter predominantly in the Bay of Biscay. However, the use of satellite transmitters has revealed that adult skuas winter over a huge area from the Bay of Biscay in the north, to Mauritania in the south, and eastwards into the western Mediterranean Sea. At present it is unclear whether great skua migration to west Africa is a newly developed habit or whether ring recoveries simply do not occur in that region. Great Skuas represent a good model to investigate how changes in food supplies may alter migration strategies in non-passerines, as has already been demonstrated in Lesser Black-backed Gulls *Larus fuscus*. There has been a large increase in fishing activity on the west African continental shelf and this may provide novel feeding opportunities for Great Skuas in that region. To support this study novel forensic techniques such as fatty acid and stable isotopes analysis were employed to investigate winter diet.

LINKING FORAGING HOT SPOTS OF AFRICAN PENGUIN *Spheniscus demersus* WITH THE DISTRIBUTION OF PELAGIC PREY IN THE BENGUELA

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Knowledge of the functional link between predator performance and prey availability is essential to understand ecological processes. Such information is extremely scarce within the higher trophic levels of marine food chains because parallel studies of predators and their prey are logistically challenging. Using newly developed GPS data loggers combined with time-depth recorders we collected fine-scale information about the three-dimensional foraging patterns of 38 African Penguins (*Spheniscus demersus*) targeting pelagic fish (*Sardinops sagax* and *Engraulis japonicus capensis*) off southern Africa. Spatial analysis allowed us to define foraging hot spots exploited by the birds. The distribution and the abundance of pelagic prey were determined synoptically via hydroacoustic surveys conducted within the study zone. African Penguin populations are declining throughout Southern Africa, and the species has been classified as 'Vulnerable'. Previous studies have shown that inter annual differences in African Penguin breeding success is linked to the overall abundance of pelagic schooling fish, but our data allow the first fine-scale test of the extent to which breeding African Penguins are food-limited.

DO DIFFERENT PETREL SPECIES FEED THEIR CHICK DIFFERENTLY?

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Fulmarine petrels are seabirds abundantly present in Antarctic waters, and breed in high numbers in the Antarctic region. The main adaptations for a reproductive life at high latitudes are their contracted breeding cycles and a high frequency of feeding the chick. Next to the feeding frequency, the amount of food brought to the chick is important for chick growth. On Ardery Island (66°S 110°E), we compared the chick provisioning strategies of the closely related Antarctic Petrel (*Thalassoica antarctica*) and Southern Fulmar (*Fulmarus glacialoides*) by using an automated weighing system with artificial nests. Although both species have a similar diet, Antarctic Petrels continued a pattern of long foraging trips even in the chick period when the extent of sea-ice was minimal and allowed nearby feeding. Fulmars made much shorter trips delivering much more meals to their chicks. The sizes of meals delivered by both species were similar. Despite lower feeding frequency but similar meal sizes, the growth of Antarctic Petrel chicks was comparable to that of Southern Fulmars, and so was the time needed until fledging. We discuss how Antarctic Petrel chicks are able to achieve higher growth efficiency per delivered meal. Differences in wing morphology of Antarctic Petrels and Southern Fulmars may explain their different foraging techniques and duration of foraging trips.

PASSERINE TRYPANOSOMES: MORPHOLOGICAL HETEROGENEITY AND SPATIAL DISTRIBUTION OF VECTORS

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Trypanosomes (*Protozoa: Kinetoplastida*) belong to widely distributed bird blood parasites, transmitted by bloodsucking insects. However, information about their host and vector specifity, life cycles and species number is scarse. Black flies (*Eusimulium* spp.) have been confirmed as vectors of *Trypanosoma avium*, *T. corvi* is probably transmitted by louse flies (*Ornithomyia*). SSU rRNA sequence of trypanosome strain isolated from mosquito *Culex pipiens* revealed that it is also a bird trypanosome. In a previous study, we have found several bird of prey species infected only with *T. avium*, while the bird host of *Culex* trypanosome was not found. Passerines as candidate hosts were caught in Páálava, Southern Moravia, Czech Republic. We examined 372 passerines of 23 species, trypanosomes were found in 80 individuals, intraspecific prevalence reaching 56% in *Coccothraustes coccothraustes*. Two morphotypes were found which differ significantly in cell length and width, and the length of the flagellum. One form is probably *T. avium*, while the other one might be a new species.

To study the infuence of vector spatial distribution, bloodsucking insects were caught simultaneously at ground level and in canopy. Signicant differences were found in insect abundances: black flies and biting midges are more common in canopy while mosquitoes near the ground. The height of the nest thus may influence exposure to *Trypanosoma* transmitting vectors.

PARALLEL SESSION B3

CONTRIBUTED PAPERS (3)

WHY WOOD WARBLERS *Phylloscopus sibilatrix* ARE NOMADIC?

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Throughout their range Wood Warblers behave like an irruptive species. Similarly, in the Białowieża Forest (Poland) their population maximum exceeded minimum by a factor of 18 during 20 years, and the maximum year to year increase was more than elevenfold. Such rapid increase could not be accounted for by local demography (unusually high survival after an exceptionally productive seasons), thus large scale immigration of birds from other areas had to occur at least in some years. The extremely low site tenacity of this species, indicates that the large scale emigration of birds from the forest had to occur as well. The Wood Warbler numerical fluctuations in the Białowieża Forest were strongly negatively correlated with the numbers of small rodents – important nest predators These results suggest that Wood Warblers looked for safe nesting areas – that they estimated density of rodents upon arrival, and did not stay when they perceived the predation risk as too high. This reason of being nomadic seems unique, irruptions in other species are usually caused by fluctuations in their food supply

NEIGHBOURS: FRIENDS OR FOES? INTERACTIONS BETWEEN RESIDENT AND MIGRANT BIRDS, THE GREAT TIT *Parus major* AND THE PIED FLYCATCHER *Ficedula hypoleuca*

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Interspecific competition usually results in large costs for inferior competitor. Therefore weaker species is expected to avoid contact with rivals. However, in an earlier study (*Proc R. Soc. B* 269 1619-1623), we showed that Pied Flycatchers preferred nest sites in the vicinity of tit nests and gained fitness benefits, even though they suffer from competition with tits (*Parus* spp). This result suggested existence of positive interspecific interactions, which are very rarely described among mobile animals. In this study we examined whether it is true: do also tits get benefits? Experiment was conducted at a nest site scale with nest boxes, and it consisted of three treatments: 1) Great Tits and 2) flycatchers breeding alone and 3) breeding as neighbours (20 m apart). In the experimental set up, the assignment of nests to treatments and spatial location of nests was randomized for both species. This was done by moving tit nests to a random location and then flycatcher nests either close (20 m from a tit nest) or further away (120 m) from a tit nest during egg-laying. Results suggest that tits breeding with flycatchers produced on average 2 fledglings less than tits breeding alone, whereas flycatchers slightly benefited from co-existence in terms of heavier nestlings. In conclusion, there are no positive interactions between these species. In contrast, flycatchers seem to parasitize the presence of tits and tits bear all the costs In concert with the earlier study, this result indicates that flycatchers use tits as a cue for good quality nest site in terms of food resources.

ENERGY USE AND ENERGY AVAILABILITY IN EUROPEAN AND NORTH AMERICAN FOREST BIRD COMMUNITIES

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Energy availability and other climate related factors are important correlates of geographical variation in species richness but less is known about the mechanisms how increasing energy leads to more species. In this paper we test the underlying assumptions of the species-energy theory that increased energy availability translates into an increase in the energy consumption of the community, which in turn positively relates to species richness. We used a comprehensive collection of published breeding bird survey data and estimates of actual evapotranspiration. We found support for the hypothesis that energy use in breeding forest bird communities is coupled with the productivity of the environment. Species richness was a positive function of both total density of individuals and energy flow through the community. This indicates that the positive relationship between species richness and available energy may indeed stem from increased energy availability resulting in increased energy flux through the community. Increased energy availability supports a higher number of individuals in the community, and the number of species in the community is a function of the total number of individuals. Moreover, we found that not all migratory groups in the community are limited by the same aspect of productivity suggesting that climatic variables influencing energy consumption, population densities, and ultimately, species richness are not necessary the same for migrants and sedentary species

FORAGING BEHAVIOR OF EURASIAN THREE-TOED WOODPECKERS *Picoides tridactylus* IN RELATION TO SEX AND SEASON IN GERMANY

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I studied year-round foraging behavior of 28 color-banded Three-toed Woodpeckers from 1995 to 1999 in Berchtesgaden National Park, Germany. My research focused on how foraging time by woodpeckers was divided among various substrates and foraging techniques. Foraging behavior was recorded by instantaneous sampling during independent observation sessions (= foraging bouts). A combination of tapping and pecking was the most important technique used during breeding (> 43%) and non-breeding (> 59%) for foraging. Both mean and maximum foraging bouts lasted longer during non-breeding periods (17.0 ± 3.7 min, and 61.9 ± 30.2 min) than during breeding periods (4.3 ± 3.0 min, and 15.5 ± 16.1 min). Sap-sucking was observed exclusively during breeding. Males spent less time foraging on branches, whereas females spent less time in the lower third of trees on which they foraged. Males also manipulated foraging substrates more by pecking and digging (probing), whereas females did more climbing and position changing on foraging trees. I concluded that (1) Three-toed Woodpeckers changed their foraging techniques according to their seasonal diet, and (2) during breeding, males used better foraging grounds than females

PLUMAGE ORNAMENTATION AND MALE QUALITY IN PIED FLYCATCHER *Ficedula hypoleuca*

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Individual and life time variation of white ornamentation in relation to dorsal coloration and breeding status of Pied Flycatcher males was studied in Moscow region in 1996-2004 Mean colour type changed from 5.1 (n = 450) in young males to 4.0 (n = 797) in old (≥ 2 ys) males, ranging from 2 to 7 by DROST's (1936) 7 step scale. Factor analysis revealed two independent sources of variation of plumage in male ontogenesis. Forehead patch (FP) and white wing ornament varied in relation to both primary and final DROST's colour type of a bird Tail ornament was mainly influenced by final breeding plumage acquired by old males. Current colour type of a male was related to probability of its breeding only in immigrants. Among pale males, future return rate was affected by previous breeding experience. The return rate of conspicuous males was not related to success of previous breeding attempts. In pale males, individuals with single FP were better in their breeding attempts than birds with double FP. Pale and conspicuous males differed in patterns of year to year plumage change. In pale males, previous breeders had higher rate of FP widening than previous non-breeders. In conspicuous males, previous breeding led to weakening of dorsal melanin pigmentation. Among pale males, both previous breeders and non-breeders tended to be darker, but darkening in non-breeders was stronger than in breeders. Thus, depending on colour type of potential mate, female may use different phenotypic clues to evaluate male reproductive experience. Field manipulations are required to clear the problem

IS IT POSSIBLE TO PREDICT SUCCESSFUL MARRIAGE? SPATIAL FACTORS AND INDIVIDUAL CHARACTERISTICS AFFECTING BREEDING IN CAPTIVE GREAT TITS, *Parus major*

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The role of spatial factors and behavioural personality in future breeding of Great Tits was studied on yearlings kept in outdoor aviaries during winter and spring in 2002-2004 Pairs were formed randomly and placed in single (2 x 2 x 2 m, n = 44) and double (n = 24) aviary rooms. Some of birds (n = 46) were preliminarily tested in open field to study their exploration scores in novel environment using DINGEMANSE's *et al*. (2002) technique Pairs kept in double rooms bred more often than pairs in single rooms In double rooms, breeding probability was higher in females which quickly explored both rooms than in females which were attached to one room. Similar tendency was peculiar for males Males which showed high scores in novelty tests (so called "fast" birds) more actively used both rooms than "slow" males "Fast" females had more chances to start breeding than "slow" ones, while this asymmetry wasn't found in males. Fast" females bred later than "slow" ones. On other hand, females paired with "fast" males "performed sexual displays and bred earlier than mates of "slow" males. Within pairs, the more was the superiority of a male by exploration score, the higher was the probability of development of its sexual behaviour

Thus, under limited spatial conditions, females tended to be more sensitive to the territory size in terms of future reproductive decision than males did. Opposite trends of breeding demonstrated by females and males of the same behavioural phenotype suggest that effective breeding is influenced by interaction between personal characteristics of potential mates.

MEASURING NATAL DISPERSAL DISTANCES IN THE PIED FLYCATCHER *Ficedula hypoleuca* ON THE COURISH SPIT ON THE BALTIC SEA

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The study of natal dispersal of Pied Flycatchers on the Courish Spit was started more than 20 years ago. Over this period, 9534 nestlings were ringed at different sites in the Russian part of the Courish Spit. Captures of birds in spring, mainly of males, not only at nests, but also in empty nest-boxes, allowed us to recapture 578 (6.1%; 7.8% males, 4.4% females) individuals ringed as pul.i. I assumed that juvenile Pied Flycatchers disperse for varying distances during their postfledging movements and imprint a local area, some 1–5 kilometres in diameter (Sokolov, 1997). This area is the goal of their migration next spring. It is suggested that in spring, yearlings are non–randomly distributed with respect to the area they have imprinted as juveniles. The distribution of natal dispersal distances was compared with the null model, which assumes that Pied Flycatchers settle randomly in the study area. The distribution of females natal distances (mean 6.8 km, SE = 0.81, median 5.4 km) was not significantly different from the pattern predicted by the null model (Wilcoxon matched pairs test: $z = 1.25$; $p = 0.21$). Conversely, males settled significantly closer to their natal nest box (mean 4.3 km, SE = 0.57; median 2.5 km) than predicted by the model (Wilcoxon matched pairs test $z = 2.45$, $p = 0.014$). For example, 24% of males settle within one km from their natal site, as compared with 7% predicted by the model. Males are found with a greater than chance probability within the 7 km zone around their natal site. Many males settle in their local natal area which their probably imprint during the postfledging exploration. Females are known to settle at some distance from their natal nest box. This does not mean that juvenile females do not imprint a home area during the postfledging period. I think that the reason for this is not the inadequate navigational ability of the females but the fact that they were attracted by a prospecting male at some distance from their migratory destination and settle there.

HOME RANGE AND HABITAT UTILISATION OF PYGMY OWL *Glaucidium passerinum* – A RADIO-TRACKING ANALYSIS

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The Pygmy Owl is one of our most inconspicuous birds. His small size, cryptic plumage design and covert way of living complicate long-term investigations of its behavioural-ecological requirements. However, accurate knowledge is essential to analyse the adaptation of the Pygmy Owl to its habitat. To gain an insight in the territorial system of this species, we investigated the land use and the habitat selection of nine adult Pygmy Owls by radio-tracking in the years 2003-2005. In the densely populated study area (Thuringia, Germany), adult Pygmy Owls have a home range size of 165 ha ± 67 ha. Male and female home ranges do not differ in size. It seems that home ranges of male and female who are paired overlap only during breeding season. After the breeding season, females migrate out of the males' home ranges.

Furthermore we will talk about the differentiated individual requirements of habitats. The individual habitat preferences have been identified by comparing the single observed locations of a bird with the overall study area characteristics. Based on these comparisons we can make a statement referring to the utilisation on different habitat structures.

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CONTRIBUTED PAPERS (4)

PRINCIPLES OF ORIENTATION CAGES DATA EVALUATION

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Traditional way of orientation data analysis assumes that both tested individual as well as a group of migrants can show only one preferred direction, at least calculation procedures that are applied to these data, i.e. calculation of mean angle both at individual and group level prove that such assumption is made. The only exception when multimodal behaviour is accepted are bimodal data when special procedure called "doubling of angles" is applied. When first introduced a new method, Busse (1995) faced a problem of orientation data analysis because of differentiated pattern of individual bird behaviour he found. Orientation data had one or more local mathematical maxima, i.e. each individual showed one or more preferred heading that he called "vector" as having defined direction and length Within seven studied species bimodal behaviour was the most common, while also birds showing three and four "vectors" were observed. In the study comparing two types of orientation cages – Emlen funnel cage and Busse's flat cage, percentage of birds showing multimodal behaviour was also similar – birds showing two vectors dominated but birds showing three vectors comprised over 30% during day-time tests while at night it was nearly 20% Thus multimodal bird behaviour seems to be a normal feature of orientation data The presentation gives a proposal of orientation data evaluation method that accepts multimodal bird behaviour, and as a consequence also a new graphics are being proposed. At the moment a simplified 16 sector radar graphs are presented but as a final goal: mathematical models based on the Bayesian methods are being developed.

DIRECTIONAL PREFERENCES OF PASSERINES CAUGHT DURING THEIR FIRST AUTUMN MIGRATION – NEW HYPOTHESIS OF BIRD NAVIGATION

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Our knowledge of bird navigation is mainly based on the results of orientation experiments conducted in laboratories A new, simpler experimental method (Busse's cages) allows researchers to gather a greater number of tests in the field on actually migrating birds that incorporate their past experience and connection to the environment. In 2478 experiments carried out at two ringing stations located in the Kızılırmak delta (N Turkey), we studied the directional preferences of 9 species of passerines. We found a high degree of similarity in the results of experiments conducted in three consecutive years at one ringing station, but the results at the other station - located only 22 kilometers away - were entirely different. We discuss a possible interpretation of the results found in these, and other, orientation experiments performed in the field, and formulate a new hypothesis on the navigation of passerines during their first autumn migration to wintering grounds.

A COMPARISON OF EMLEN FUNNEL AND BUSSE'S FLAT CAGE FOR ORIENTATION STUDIES

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The EMLEN funnel cage was introduced in 1966. Since then it has been used in numerous studies on bird orientation. In 1995, BUSSE proposed another technique – in the form of flat, round cylindrical cage. BUSSE also tested nocturnal migrants in the daytime. He, and NOWAKOWSKI and MALECKA (1999), proved that birds tested in daylight and at night displayed similar distributions of their preferred directions. This study also supports their findings ZEHTINDJIEV *et al.* (2003) found that results in EMLEN funnel and BUSSE's flat cage were coherent, despite the tests were performed in different conditions (night-day) and in different years. This study is the first one that compares results of the same individuals tested in the two types of orientation cages during the day ($N = 75$) and night ($N = 17$). Results of both methods did not differ (WATSON's two-sample test, MANN-WHITNEY U-test of angular dispersion) both during the day and at night. Multiheading bird behaviour is common in both types of cages and seems to be a normal feature of orientation data The only difference was found in bird activity (*i.e.* number of scratches during 10 minutes of testing) that was higher for BUSSE's flat cage in daytime tests

ORIENTATION OF THE SEDGE WARBLER *Acrocephalus schœnobænus* (L.) DURING THE AUTUMN MIGRATION IN THE WESTERN UKRAINE

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The main directions of the orientation of Sedge Warbler during the autumn migration in the western Ukraine as well as some peculiarities of the orientation preferences of young and adults birds are described in the present note. The data on the orientation of the Sedge Warbler during migration through the territory of the western Ukraine remarkably deviates from the same type of information from western Europe. The study of the migration directions was conducted on the Cholginski ornithological reserve (49 58N 23 28E) during nine years (1996 04) using special cages following the method of BUSSE (1995) A total of 414 orientation tests were performed, among them in 379 the selection of direction differs considerably from the accidental. Raw data was analyzed with using computer software Orient 4 0, Statistica and Quatro Pro 8 0 for Windows. All studied specimens of the Sedge Warbler followed along three directions of the migration: SE, SSW, WSW; two of which are the most distinct. Most part of adult birds prefer WSW direction, whereas one year old bids prefer SE and SSW directions 77.3% of studied birds (80 6% of young and 68.7% of adult) choose one direction, while 22 7% choose two or more directions of the migration: 19 0% of young and 29 3% of adult choose two directions; 0.4% of young and 2.0% of adult choose three. Recovery data support the SSW and WSW directions of the migrations, while SE direction was never confirmed by the recoveries. All three directions of migration are distinct, while the fact that individual birds choose just one direction in most cases, may point that three different populations of the Sedge Warbler migrate through the territory of the western Ukraine.

FEEDING ECOLOGY OF EXPANSIVE YELLOW-LEGGED GULL *Larus cachinnans* IN SOUTHERN POLAND: HABITAT UTILIZATION, FORAGING TACTICS AND AGE RELATED EFFICIENCY

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The Yellow-legged Gull *Larus cachinnans* occurred originally in the Mediterranean and Black Sea basins, lately it has become an expansive species in Europe. First breeding in southern Poland was recorded in early 1990s, the population size of this species has risen and northward range expansion has followed In 2000-01 we studied feeding ecology of Yellow-legged Gulls breeding at the largest inland colony of this species located in sedimentation basin near Tarnów (southern Poland). We found that gulls stored a large number of food items at the nests, what indicates the high quality of feeding conditions in the area. Many more food items were found during the chick-rearing period than during the incubation period. In both periods fish were numerically dominant, but during incubation there was significantly more human refuse at nests, and less of other bird species from the breeding colony Among fish, Carp *Cyprinus carpio* was a dominant species. During the pre-breeding period most birds foraged on a refuse dump during the chick-rearing period fishponds were the most important foraging grounds. The success of three main foraging tactics was analysed: digging, fishing and kleptoparasitism We expected that during maturation an energetically low cost tactic (digging on refuse), should improve in the rate of food searching, while a high cost tactic (fishing) should improve over years in a better assessment of the probability of food catching We found that digging success was higher in juveniles than in immature or adult birds, however, older birds moved and ate more items per unit of time than juveniles. The opposite was found for fishing success. Despite juvenile birds made fewer attempts than immature or adult birds, fishing success was higher in adults. Kleptoparasitism was observed almost exclusively during the pre breeding period on the refuse dump. Young birds kleptoparasited more frequently than adults, but they had lower success, they kleptoparasited Black-headed Gulls *Larsus ridibundus* and Jackdaws *Corvus monedula* more frequently than adults.

SEXUAL SIZE DIMORPHISM AND SEX RATIO IN BIRDS

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Sexual size dimorphism (SSD) in birds may be an important factor influencing sex ratios at different life stages. Higher energy requirements associated with larger body size could lead to both an overproduction of the smaller sex and a greater mortality of the larger sex, resulting in a population bias towards the cheaper sex. After an extensive literature search on SSD and sex ratios for 99 species, we used a comparative approach to explore the association between sexual size dimorphism and hatching, fledging and operational sex ratio. There was a significant inverse relationship between the proportion of males at hatching and the degree of SSD, as measured by the Storer's index [male-female/(male + female)*0.5] However, normal size dimorphic species did not differ from parity, whereas monomorphic and reversed size dimorphic (RSD) species showed a proportion of males above parity. In contrast, fledging sex ratio showed a similar trend but closer to parity and operational sex ratio was not related to the degree of SSD. These results therefore suggest that a greater mortality of males in RSD species and, to a lesser extent, in monomorphic species, is compensated by an overproduction of males

DISTRIBUTION AND HABITAT SELECTION OF THE BLACK-BILLED MAGPIE IN URBAN LANDSCAPE

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Urbanisation affect structure and function of ecosystems. This process threatens sensitive species as well as favours others well adapted to humans that quickly increase more than in native habitats. These ongoing changes address challenges in conservation science, either to restore or to control populations, and new topics in ecology Our talk investigates how the human component may strongly contrast the dynamics of the Black-billed Magpie population in France We address three approaches, the regional, the landscape and the local scales First, We question whether the abundance and the growth rate of magpie populations increase along a rural urban gradient. Results are based on the French Breeding Bird Survey and the Corine Land Cover database. Second, We propose a landscape approach to explain the spatial heterogeneity of magpie distribution in suburban areas surrounding Paris France We test the relationship between the variation of estimated abundance in relation to patch and matrix characteristics. Finally, We improve understanding of habitat selection by breeding pairs and the relationship between local density and the availability of food brought by humans.

Results suggest that magpie largely benefit from human presence. Urban areas support highest density and growth rate of population. This opportunistic species is not limited by urban landscape disturbance. It's well-adapted to anthropogenic food resources that partly explains the abundance of population in suburbs.

ARE UNDOMED NESTS BUILT BY YOUNG MAGPIES *Pica pica*?

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Nest building by birds has a genetic determinant, but additional constructions such as roofs may also have a learned component Normally Magpie nests are domed. However in Zielona Gora (W Poland) about 30% of nests are undomed. This is a typical urban population at high density. In the Magpie pair, one bird is usually older than the other one. This helps in teaching the younger bird by the more experienced one We hypothesise that in a fast growing urban population of magpies a greater number of young birds enter the breeding cohort. We expect differences in egg and clutch sizes in younger females who are known to produce smaller eggs (Birkhead 1991). We measured eggs from 60 clutches (51 from domed & 9 from undomed nests) between 1998 and 2004 in Zielona Gora. There were no statistical differences in clutch size or egg size between the two nest types (clutch size $t = -0.54$, $df = 58$, $p = 0.59$, eggs size analysis (length & vol.) two-way ANOVA, length: $F_{1,54} = 0.19439$, $p < 0.66$, volume $F_{1,54} = 0.021$, $p < 0.89$) This suggests that undomed nests were not build specifically by young females. Also the lack of differences in breeding success between domed and undomed nests suggested that predation pressure (e.g. *Corvus cornix*) in the town was not a significant factor It may be useful to compare urban and rural populations to see if magpies build more undomed nests in towns

PARALLEL SESSION C1

MIGRATORY BIRDS AND PARASITES

INTRODUCTION

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Migratory birds might be involved in dispersal of microorganisms as their biological or mechanical carriers, or transporters of infected hematophagous ectoparasites (ixodid ticks). Many microorganisms pathogenic to homeothermic vertebrates including humans have been associated with migrating birds, e.g. some arboviruses (Eastern and Western equine encephalomyelitis and Sindbis alphaviruses, West Nile and St. Louis encephalitis flaviviruses), influenza A virus, Newcastle disease virus, duck plague herpesvirus, *Chlamydophila psittaci*, *Anaplasma phagocytophilum*, *Borrelia burgdorferi* s.l., *Campylobacter jejuni*, *Salmonella enterica*, *Pasteurella multocida*, *Mycobacterium avium*, *Candida* spp., and avian hematozoans (cf. *J. Wildl. Dis.* 40: 639-659, 2004). The efficiency of dispersal of pathogenic microorganisms depends on a wide variety of biotic and abiotic factors affecting the survival of the agents in, or disappearance from, a habitat or ecosystem in a new geographic area.

HABITAT RELATED DIFFERENCES IN AVIAN MALARIA INFECTIONS AND IN INNATE AND HUMORAL IMMUNE RESPONSES, IN SHOREBIRDS

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Migratory shorebirds show strong dichotomies in habitat choice, with high arctic-breeding species being restricted to coastal marine habitats during the nonbreeding season, and the more southerly breeding species using inland habitats. It has been hypothesised that disease risks are higher in inland habitats, so that in shorebirds this difference in habitat choice may lead to differences in exposure to wildlife diseases. Furthermore, differences in host behaviour and differences in immune investment may also cause interspecific variation in parasite prevalence. In migratory shorebirds there is a clear pattern in the distribution of avian malaria. Species using tropical inland wetlands have a higher infection rate than species that winter elsewhere. Moreover, coastal species with scavenging habits (e.g. the ruddy turnstone) may also show a high prevalence of disease, especially avian influenza. However, the relationship between disease risk and immune investment is still unclear. Part of the problem is due to an incomplete survey of wildlife diseases, and part comes from the specificity of the immune responses. In this talk, we will present data on avian malaria prevalence in wild shorebirds captured along the East Atlantic Flyway, and several immune measurements from both free-living and shorebirds held in captivity.

HOST SHIFTS OF AVIAN MALARIA PARASITES AND OTHER HAEMOSPORIDIANS: A NEW APPROACH TO STUDY EMERGING DISEAES

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A parasite shift to an unusual host may be of serious evolutionary consequence because the host shifts are usually associated with change in virulence and may lead to evolution of emerging diseases. However, this phenomenon remains insufficiently studied in wildlife. The main aim of this study was to investigate occurrence of the same genetic lineages of avian malaria parasites and other haemosporidians (*Sporozoa, Haemosporida*) in different avian hosts on the Curonian Spit in the Baltic Sea (55° 05' N, 20° 44' E).

The material was collected in May-July 2003-2004. From each bird, blood smears were prepared and approximately 50 μl of blood was fixed in SET buffer for molecular assays. The nested PCR protocol was used for amplifying and sequencing a fragment of 480 nucleotides of the cyt *b* gene of the mtDNA of *Plasmodium* and *Haemoproteus* spp. Samples from 243 birds, which were positive both by microscopic examination and mtDNA amplification, were used in this study.

We found that *Haemoproteus majoris* (lineages WW2 and PARUS1), *Haemoproteus* sp (PHSIB1), *Haemoproteus fringillae* (CCF5), *Haemoproteus* sp. (WW1), *Plasmodium* (*Haemamoeba*) sp.1 (SGS1) and *Plasmodium* (*Haemamoeba*) sp 2 (GRW11) repeatedly completed there live cycles in birds belonging to different families of the Passeriformes at our study site. These data show that some haemosporidian parasites, especially *Haemoproteus* spp., are less specific as have been traditionally believed Prevalence and intensity of the parasites in unusual avian hosts was low, indicating possible high forth of the infections on unusual hosts

The obtained data show some directions how experimental research on virulence of avian malaria parasites and other haemosporidians parasites may be planned in the future

INNATE IMMUNITY IN STONECHATS WITH DIFFERENT MIGRATORY STRATEGIES: IS IT RELATED TO ENVIRONMENTAL RISK OF DISEASE OR LIFE EXPECTANCY?

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Immune defense directly affects survivorship and fecundity, but is costly. We explored two contrasting hypotheses that could explain investment into immune defense: 1. Animals that live in parasite-rich areas or encounter multiple environments, for example during migration, invest more in immune defense. 2. Longer lived species have larger investments in immune defense. We measured overall innate immunity of individuals from three Stonechat (*Saxicola torquata*) populations and of their hybrids housed together in a common environment. Stonechats from different environments display different life history traits. Kenyan Stonechats (*S. t. axillaries*) are year-round residents, are relatively large, and have small clutch sizes (3 eggs) Central European Stonechats (*S. t rubicola*) are short-distance migrants, intermediate in body size, and have intermediate clutch sizes (4-5 eggs). Kazakhstan Stonechats (*S t maura*) migrate long-distances, have the smallest body size and 6 eggs per clutch. We assessed overall innate immunity by examining the bactericidal ability of blood when subjected to *Escherichia coli* (Gram negative) and *Staphylococcus aureus* (Gram positive), during spring migratory restless

ness. The Kazakhstan population, that encounters the largest variety of environments during this life cycle stage, demonstrated the best bactericidal ability. The hybrid populations fared less well than either of their parent populations. We conclude that during migratory restlessness, immune investment appears to be related to environmental likelihood of infection

HOW MANY SPECIES OF TRYPANOSOMES ARE THERE IN BIRDS?

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Avian trypanosomes are heteroxenous parasites with two different hosts in their life cycle. birds and bloodsucking arthropods. Although they belong to most widespread parasites of birds, little is known about their bionomy, probably due to their low pathogenicity. Species were described either on the concept "one host – one trypanosome species", or all bird isolates were included into a single species, *T. avium*. In order to elucidate bird trypanosome diversity, we decided to aply a method of molecular taxonomy (RAPD analysis).

In our previous studies it was found that trypanosomes from raptors are transmitted by black flies and belong to *T. avium* species complex Another bird species, *T. corvi* from corvids, is transmitted by hippoboscid flies We used trypanosomes isolated from raptors and passerines and from potential vector species (black flies, hippoboscid flies, mosquitoes) from South Moravia, Czech Republic. For the analysis we originally chose about 140 strains. However, due to similar RAPD-types of some strains the number was reduced to 45 Interestingly, most isolates from black flies formed a clade distinct from *T avium* (raptor clade), while only few clustered with *T. avium*. All isolates obtained from hippoboscid flies were closely related to each other, and probably represent *T. corvi*. Culicine isolates formed another clade. According to our preliminary results, most of passerine isolates are not related to any group of our isolates, while some of them obviously belong to the raptor clade. The results show that our trypanosome isolates form multiple clades, and that one vector can transmit several trypanosome species.

PARALLEL SESSION C2

SMALL-SCALE ANTHROPOGENIC EFFECTS ON THE BREEDING PERFORMANCE OF BIRDS

INTRODUCTION

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Much attention has been focussed on large-scale phenomena (e.g. global climate change, acidification) resulting from human activity and how they impact on various aspects of avian ecology. For example, first arrival dates of spring migrants in North America and Europe have advanced in successive years as a result of increasing spring temperature. In north-western Europe, small passerines have struggled to mobilize calcium for egg formation as a result of acidification of woodland breeding habitat. Needless to say, such phenomena can have dramatic adverse effects on avian breeding performance but other, more localized factors can be equally disruptive, albeit on a smaller scale. To date, small-scale anthropogenic factors have been relatively under-studied.

The purpose of this symposium is to explore the extent of small-scale perturbations on the breeding performance of birds as a result of human activity, and to explore the directions in which future work might proceed. Human settlement is accompanied by development of transport and power distribution systems, habitat modification through agricultural intensification, industrialization, urbanization and suburbanization, and changes in nutrient availability through acidification, contamination and localized food supplementation. As such, human activity can have marked effects on avian breeding ecology with changes in breeding habitat structure, phenology, resource availability, population dynamics and behaviour. Although such effects may be detected at a relatively local scale, they can be portents for disruption of avian breeding performance at a far broader scale. Extensive disruption of avian breeding might be realised if localized disturbance of important source populations occurs.

The extent of small-scale human perturbations of avian breeding performance is broad and below we provide a selection of factors that might impact on avian reproduction and might be covered in the symposium: direct food supplementation in gardens, changes in resource availability and predation pressure as a result of urbanization and suburbanization, electromagnetic fields from powerlines, wind turbines, changes in agricultural practices, pesticides and pollutants, accidental bycatches in commercial fisheries and ecotourism.

CHANGES IN GROWTH AND THYROID FUNCTION OF AMERICAN KESTRELS EXPOSED TO ENVIRONMENTALLY-RELEVANT POLYBROMINATED DIPHENYL ETHERS

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Polybrominated diphenyl ethers (PBDEs) are a class of flame retardants that are ubiquitous and bioaccumulative environmental contaminants. Over the last decade, there has been an exponential increase in tissue concentrations in certain wildlife and human populations in the world. Changes in the development and thyroid function of American Kestrel (*Falco sparverius*) nestlings were assessed following *in ovo* and dietary exposure to environmentally-relevant PBDE congeners and concentrations. Eggs within each clutch, divided between groups by laying sequence, were injected with safflower oil or Penta-BDE congeners BDE-47, -99, -100, and -153 dissolved in safflower oil (18.7 μg total ($\sum$) PBDEs/egg), approximating current levels in Great Lakes Herring Gull (*Larus argentatus*) eggs. For 29 days, nestlings consumed the same PBDE mixture (15.6 ± 0.3 ng/g body weight/d). Relative congener abundances in the dosing mixture compared to the carcasses suggests biotransformation of BDE-47; BDE-183 was also detected in the carcasses. PBDE-exposed nestlings were larger (weight, bones, feathers) because of greater food consumption, itself a function of $\sum$PBDE concentrations. BDE-100 was the most influential congener on nestling growth, being positively associated with larger size, faster growth, and greater food consumption. Increasing concentrations of BDE-183 and -153 were correlated with increasing bone length, and BDE-99 with longer feathers. The growth of birds is partially governed by the thyroid hormones, thyroxine (T4) and triiodothyronine (T3). Relative to the controls, the PBDE-exposed nestlings had significantly lower plasma T4 concentrations which were negatively correlated with BDE-47, BDE- 100, and BDE- 99. However, T3 levels and thyroid gland structure were comparable between the two groups of nestlings, and were not correlated with any of the PBDE congeners. The results of this study indicate that the PBDE concentrations currently found in Great Lakes and European birds are capable of affecting the growth and thyroid function of nestlings.

GOOD START, LOUSY FINISH? GROWTH AND SURVIVAL IN SUBURBAN FLORIDA SCRUB-JAY NESTLINGS

ANNETTE SAUTER, REED BOWMAN & KARIN SCHIEGG

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Urbanization is increasing but its impact on animals apart from habitat loss is not well studied. Natural foods generally decrease in urban areas, while human-provided foods increase. We studied variation in nestling growth and survival by supplementing suburban (n = 28) and wildland (n = 55) Florida Scrub-Jay (*Aphelocoma coerulescens*) families with natural foods during the first 10 days after hatching of the young. Suburban broods at the age of 3 days post-hatching contained equal numbers of nestlings, had higher within-brood mass asymmetries and were heavier than wildland broods of the same age. By 11 days post-hatching, brood masses did not differ. Food supplementation increased nestling mass at 11 days and decreased brood reduction and the effect on mass was stronger in the suburban habitat. Post-fledging survival was lower in the suburban habitat, but was not influenced by food supplementation in either habitat. Access to human-provided food may allow suburban parents to invest better in egg quality or to provision better the young at an early age. As the nestlings grow older a diet that includes human-provided foods may not meet their nutritional needs, resulting in reduced growth when compared to wildland nestlings. Nevertheless, reduced nestling survival in the suburban habitat cannot be explained only by impaired nestling growth. The higher within-brood mass asymmetry might facilitate brood reduction and therefore contribute to the decreased nestling survival.

ENVIRONMENTAL CHANGES AND POPULATION TRENDS OF BREEDING WATERFOWL IN THE NORTHERN BALTIC SEA

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Seabirds are an important component of marine ecosystems, usually as predators at the top of food chains. They are regarded as good indicators of environmental changes, and may help to reduce the gap in our knowledge of marine ecosystems under stress. However, most studies until now only document bird population changes without connecting them with environmental changes. We modelled the impact of eutrophication, winter severity, weather conditions during breeding and water salinity on the breeding populations of ten waterfowl species in the Archipelago Sea, southwestern Finland, using generalised linear models and the program TRIM (TRends and Indices in Monitoring data). This is the first attempt to show quantitatively the connection between waterfowl population changes and environmental changes. The Goldeneye (*Bucephala clangula*), Coot (*Fulica atra*) and Velvet Scoter (*Melanitta fusca*) decreased with increasing eutrophication. The Goldeneye, Coot, Mallard (*Anas platyrhynchos*), Mute Swan (*Cygnus olor*) and Eider (*Somateria mollissima*) were most vulnerable to winter severity. We did not find evidence for impacts of breeding-time weather or water salinity on population trends. Our results suggest that eutrophication and severe winters may diminish waterfowl populations. In order to understand seabird population changes, there is a need for long-term environmental data, and data on population dynamics, such as breeding success and recruitment. More should also be known about the dynamics of marine ecosystems and the interactions between seabirds, their food resources and the environment.

BEHAVIOURAL CHANGES IN BROOD-REARING RUDDY SHELDUCKS IN HABITATS WITH DIFFERENT RATES OF ANTHROPOGENIC TRANSFORMATION

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Ruddy Shelducks (*Tadorna ferruginea*) were observed during the brood-rearing period in the Middle Volga region (little transformation), in the Askania-Nova Nature Reserve (intermediate rate of transformation) and in Moscow (heavy transformation). Both adult birds and ducklings showed noticeable differences in their behaviour in various habitats. In Askania-Nova adults were much more aggressive than in other regions, which could be explained by the extremely high density of birds. No ritualized aggression (threats) was observed in the Volga region. Birds in Moscow, constantly supplied with food by the citizens, spent significantly more time foraging than birds from Askania-Nova and, particularly, from the Volga region. The situation was the reverse when time spent resting was studied. The fraction of time spent in comfort behaviours was greater in birds from transformed habitats than from the natural ones, perhaps due to change in moult patterns. The parents left their broods for the longest periods in the Volga region, while Moscow birds remained with offspring most of the time. Adults and ducklings moved within their family ranges in Moscow and Askania-Nova much more than in the Volga region. This, together with significantly more frequent shifts in activity patterns in Moscow, seems to be a result of the greatest number of disturbance factors in the city. Brood rearing birds uttered alarm signals much more frequently in Moscow, than in the other regions, although a disturbance index (time spent vigilant) showed no significant differences between regions and was the most stable of all activity types.

THE EFFECTS OF BIRDS AND MAMMALS GATHERING ON REFUSE TIPS ON THE NEST PREDATION RATE IN THE SURROUNDING AREAS

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Crows (*Corvus* spp.), gulls (*Larus* spp.), and some mammals gather on refuse tips, and they may also prey on birds' nests in the surrounding areas. So far, the effects of these gatherings on breeding birds around refuse tips have hardly been investigated. Thus, a study was set up near one refuse tip in the middle part of Norway in 2002 and 2003. Both artificial nests and natural breeding performance were investigated. In total 1,793 artificial nests were placed in 34 areas around the refuse tip at distances from 0-30 km away. The nests contained one Quail (*Coturnix coturnix*) egg and one plasticine egg. They were placed in different habitats/locations: clear-cut areas; edges between clear-cut areas and forests; forests; solitary trees; and on the ground. The same pattern of nest depredation was observed in all habitats and nest locations. There was a significant decrease in depredation rate with an increased distance from the refuse tip. The depredation rate was still doubled about 8 km away from the refuse tip. Birds depredated significantly more nests than did mammals, but the relative frequency did not change with distance. A standardised study of nesting birds in six different areas at various distances revealed that the number of successful nests was significantly lower in the three areas nearest to the refuse tip than further away. This leads to the conclusion that the nest depredation rate increases considerably around a refuse tip and is caused by birds as well as by mammals preying on nest contents

PARALLEL SESSION C3

USING TRACE ELEMENT ANALYSIS OF FEATHERS TO DETERMINE MIGRATION PATTERNS

INTRODUCTION

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Hungarian researchers have developed a method for analysing the concentrations of 40 elements in feathers (Ag, As, Ba, Ca, Cd, Ce, Co, Cr, Cu, Dy, Er, Eu, Fe, Gd, Hg, Ho, La, Li, Lu, Mg, Mn, Mo, Nd, Ni, P, Pb, Pr, S, Sc, Se, Sm, Sr, Tb, Th, Ti, Tm, V, Y, Yb). The innovation has been in the preparation of feathers, to minimize the impact of pollutants to which the feathers have been exposed, so that the concentrations represent the elements that were acquired by the feather during their growth. These concentrations provide an elemental signature with 40 quantitative components. A nestling acquires this trace element signature from the immediate surroundings of the nest site. The signature reflects the surface geology, diet, water, soil and vegetation of the area in which the bird was when the feather was grown. By sampling unmoulted feathers from first year birds at the migration destination the area where the swallow hatched can be determined (provided we have the trace element map of the breeding area). The method has undergone extensive "ground truthing" in Hungary, using the Sand Martin *Riparia riparia*, as test species, the feather signature changes on a scale of tens of kilometres. A pilot study of a long distant migrant, the Barn Swallow *Hirundo rustica*, has been undertaken in South Africa and in various areas of Europe. The keynote addresses cover these aspects of this research. Because of the multivariate nature of the data, the trace element technique may prove to be more sensitive to micro-geographical differences than techniques based on stable isotopes.

COMPARISON OF TRACE ELEMENTS AND STABLE ISOTOPES FOR IDENTIFYING MOULTING AREAS

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The use of feathers for identifying breeding and migration areas by studying their levels of stable isotopes has become an important tool for the detailed investigation of migration patterns in birds. Additionally, the use of the trace element method for measuring the levels of several (up to 40) chemical elements in feathers is a new and promising tool for identifying the area where the feather was moulted. In our work, we used these two methods simultaneously by analysing a pair of tail feathers collected from individual Sand Martins *Riparia riparia* at various breeding areas in Europe and from individual Barn Swallows *Hirundo rustica* at different wintering roosts in South Africa. We have found that in the European breeding areas both methods showed differences between sites from 4 km to over 1,000 km apart. The stable isotope method showed higher sensitivity in the breeding ground to the year when the feather was moulted and to the age of the birds than did trace element analysis, and this phenomenon caused difficulties in the correct grouping of the samples to the sites where the feather was moulted. In the case of the South African wintering areas, the stable isotopes showed weak differences among distant roost (over 1,000 km), while the trace element method indicated marked differences among the roosts which allowed us to classify the feathers to the studied roost on the base of its chemical profile. Freshly moulted feathers collected from two different migrant swallow species, Sand Martin and Barn Swallow, at the same roost showed difference in the chemical profile, but these feathers were properly grouped to the same site by multivariate methods. On the base of our

investigation, the trace element method showed high spatial resolution, there is difference in the chemical profile of sites with distance 50 km or less, both in the breeding and in the wintering areas In the case of stable isotopes, this resolution could vary from 4 km until more than 1,000 km, especially in the wintering areas Spatial interpretation of the stable isotope data from the African moulting areas needs further investigation. The project was supported by OTKA T042879 and TÉT DAK 13-01.

IDENTIFYING CENTRES OF ORIGIN OF BARN SWALLOWS OF INDIVIDUALS THAT MOULTED IN SOUTHERN AFRICA

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Feather samples were collected from Barn Swallows trapped at sites in South Africa during the Austral summer of 2003. The feathers that were sampled had grown in the region They were subjected to trace element analysis for the following elements: Ag, As, Ba, Ca, Cd, Ce, Co, Cr, Cu, Dy, Er, Eu, Fe, Gd, Hg, Ho, La, Li, Lu, Mg, Mn, Mo, Nd, Ni, P, Pb, Pr, S, Sc, Se, Sm, Sr, Tb, Th, Ti, Tm, V, Y, Yb. It was found that three trace elements varied as a cline across the sub-continent· Lithium and Titanium declined from west to east while Strontium declined from the sea-coast inland. It is suggested that Lithium is soluble and has been leached out of soils in the high rainfall east of the sub-continent. It is thought that Titanium is contained in the fine sands and dust that are blown across the continent from west to east. Strontium is known to exist is high concentrations in seawater and it is suspected that it is carried inland by the afternoon sea breezes. There are higher concentrations of Manganese in the Pietermaritzburg samples where it is known that there are higher concentrations of Manganese in the soils. Two pollutants were found in the feather samples. Lead and Vanadium. There were elevated concentrations of Lead in those feathers sampled near urban areas with higher concentrations in bigger urban areas. The highest concentrations of Vanadium were found in the samples collected from Barn Swallows in Middleburg, Mpumalanga Province where there is steel and Vanadium processing factory. It was concluded, on the basis of these initial and small samples that it will be possible to identify the origins of Barn Swallows moulting while in South Africa

MEASUREMENT OF THE TRACE ELEMENTS PROFILES OF SWALLOW FEATHERS IN THE AFRICAN MOULTING AREAS, METHODOLOGICAL ISSUES

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Application of the trace element methods is a promising tool for identifying the usage of the given area during the feather moulting by population/individuals both in the breeding and both in the wintering ground. Former investigation on Sand Martin in the European breeding areas showed that the trace element profile is specific for the area where the nestling hatched and it can be a useful tool for identifying breeding areas of wintering young birds. In our work we carried out similar investigation in the case of Barn Swallows at various wintering areas in South Africa with specific attention to study several questions related to the sampling, preparation of sample, effects of: time between moulting and sampling of the feather, moulting sequence, position of feathers, age of the birds, species and the year of sampling on trace element profile. Studying these methodological issues is important in the wintering areas because of the difference in the spatial and temporal pattern of the moulting comparing to the moulting of nestlings in the breeding area. Our work has pointed out the importance of the usage of same protocol during the sampling of feathers for comparing moulting areas and for applying the trace element method for

identifying wintering areas. Trace element profile of the same wintering area can vary with year which underlines the importance of the carefully designed sampling both in the breeding and both in the wintering area. The project donated by OTKA T042879 and TÉT DAK 13 01

STABLE ISOTOPE PROFILES REVEAL HABITAT SELECTION AND SITE FIDELITY IN NINE MIGRATORY BIRDS

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Migratory birds show an evolutionary response to the seasonality of resources in winter quarters by performing step migration in Africa Previous studies have shown this unique strategy of two step autumn migration to be more evident along the eastern Africa route Linking the staging sites of these long distance migrants using traditional methods has been difficult Thus the stopover areas are not known with full confidence and whether these species mix or remain separated on their staging areas is not yet defined Earlier investigation using multiple feather isotope signatures indicated that during the stopover period, with in the relatively narrow range, there occurred habitat segregation between species. However, if the suggested habitat segregation holds true for other species of similar character is not yet investigated. Thus, we examined if feather stable isotope ratios of nine species of birds show homogenous profiles We tested to what extent species with "two stages" migration strategy overlap to form a single mixed species or segregate to use a discrete stopover area Repeatability in feather isotope ratios of different years reveals species specific habitat fidelity in the stopover sites.

DISTINGUISHING BETWEEN RESIDENT AND TRANSIENT BLACKBIRDS *Turdus merula* ON AN OFFSHORE ISLAND

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Evaluating population structure is of considerable importance for answering questions about the adaptability of birds to environmental change and their potential for maintaining genetic variation. On the small, offshore island of Heligoland, German Bight, Eurasian Blackbirds *Turdus merula* have established a breeding population of around 60 pairs within the last two decades To obtain insight into the origin and genetic structure of this unique population, we applied microsatellite and multi-element analyses of feathers to ascertain population membership. Several microsatellite primers were optimized to differentiate birds of the recently founded island population from potential immigrants, e.g., stranded migrants from Scandinavian breeding populations or dispersive individuals from mainland Germany. Levels of polymorphism indicate that the applied loci are useful for analysing genetic divergence between and inbreeding intensity within Blackbird populations. We will provide first results from our multimethodological approach in understanding the processes that lead to population establishment in migratory, dispersive songbirds

PARALLEL SESSION C4

LEARNING IN SONG / INTERSPECIES ACOUSTIC COMMUNICATION

INTRODUCTION

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COMPUTER SIMULATION OF SINGING: ARE "SINGING DUEL" A SIMPLE COINCIDENCE IN RHYTHM AND ACTIVITY OF SINGING OR A DIRECT INTERACTION?

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It is well known that some times rhythm and activity of singing may coincide in two or more neighboring passerine birds. These situations are frequently called "singing duel". However the question is if these duels are real interactions between birds or just random coincidences. To answer to this question we have worked out a computer program, which can simulate singing of 2-5 birds. A user has to specify the minimum and maximum values of song durations and the duration of gaps between songs and then the program simulates random values of these parameters into the given frames. The duration of simulations is about 15 min.

The preliminary analysis of Chaffinches (*Fringilla coelebs*) singing behavior shows that in some cases [4 from 6 (15 min of singing every case)] the percent of time where two birds sing simultaneously differs from this one in the model. The differences are significant by Chi-Square, $p < 0.05$.

The different situations of singing are discussed.

A UNIQUE STRATEGY OF INTERACTION: EVIDENCE FROM THE UTTERANCE OF TWO PARTICULAR PHRASES IN DOMESTICATED MALE CANARY SONGS

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When singing alone or in front of a conspecific, a male or a female, the number of songs and the song duration of the male canaries are quite similar, except for the utterance of a particular phrase. This song phrase is composed of the repetition of a well known syllable (syllable A). We previously demonstrated that this phrase type elicited in female canaries many more copulation solicitation displays than other syllable and phrase types in the canary repertoire. The social stimulation induced modifications in male songs which were characterized by longer duration in singing syllable A per song. Moreover, when exploring the reactions of the male receivers, we demonstrated that playback of song phrase «A» is very effective in delaying male song responses. Thus, the song phrase A may enable singing males to affirm their presence and readiness to interact and to claim some aspects of their underlying condition. Singing this special discrete acoustic feature and not others in their songs may serve two different functions for male canaries: intrasexual (e.g. challenge to male competitors) and intersexual (e.g. courtship during the female receptive period). Both functions are likely to be inextricably linked together in the signal, the male or female receiver giving different meanings to the same type of vocalization. The song phrase does not have a sexual effect.

SEX AND INDIVIDUAL ACOUSTIC FEATURES OF SIBERIAN CRANE *Grus leucogeranus* AS METHOD OF CONSERVATION

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Most of cranes are endangered species and needed in monitoring. Banding is wide-spread but it may be traumatic when catching a bird, bands are invisible in high grass, it can be lost by bird. Radio and satellite transmitters are very expensive, nondurable and non-comfortable for birds. We pay attention to acoustic of cranes as source of sex and individual information.

We recorded sounds of 10 pairs of crane in the Oka Crane Breeding Center, Russia. We used tape-recorder Marantz PMD-222 and microphone Sennheiser MKH-67, Avisoft SasLab pro and discriminate analysis.

Repertoire of both young and adult Siberian Crane is consists of two main classes of sounds tonal and rhythmical. Each class includes group of various sound types, most of them are used in different context: communication of mates, communication parents-chick, aggression, threat etc. There are single sounds, which have independent sense, and successions of both tonal and rhythmical sounds. Main frequency of female voice is on average 200 Hz more, than male's one. As Siberian Cranes don't have sex dimorphism of plumage, this voice feature should be useful tool for field sexing of crane.

Monitoring of individual crane is more complicated because of voice breaking Chicks are introduced to nature before this event. For individual monitoring we need to find vocal feature of chick which are kept after voice breaking.

WARNING CALLS OF WINTERING GREAT TITS *Parus major*: ALTRUISM, RECIPROCAL ALTRUISM OR A MESSAGE TO THE PREDATOR?

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When a predator is not an immediate threat, a prey may produce a relatively loud warning call because the risk is low. Since this could nevertheless attract acoustically oriented predators, the cost of predator attraction must still be outweighed by factors beneficial to the caller. During several non-breeding seasons we tested whether giving low-risk alarm calls by male Great Tits *Parus major* can be explained in terms of altruism, reciprocal altruism or notification of predator detection. We alarmed adult males during the following social situations: (1) when they foraged within their home-ranges alone, (2) when they foraged within their home-ranges together with their mates; (3) when accompanied by other permanent flock members than mates, (4) when accompanied by unfamiliar conspecifics far outside their usual home-ranges, and (5) some of the male great tits were observed when accompanied by their mates outside home-ranges. The results show that male Great Tits gave the low-risk warning calls when accompanied by their mates independent of the situation. They also gave the low-risk warnings in the presence of other flock members. On the contrary, only some males uttered a few calls when foraging alone within their home ranges and in the company of unfamiliar Great Tits far outside their usual home-ranges. The results suggest that the utterance of warning calls may be explained as mate protection and reciprocal altruism among familiar individuals

PARALLEL SESSION D1

MIGRATION ACROSS ECOLOGICAL BARRIERS

INTRODUCTION

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A similar symposium at the International Ornithological Congress in Durban (Bruderer & Gauthreaux, 1998) took a worldwide approach, including ocean barriers in general, the Gulf of Mexico and the Mediterranean Sea as special cases, and some first hints to Sahara crossing. The introduction to the EOU symposium will briefly outline the main results of the previous approach and relate them to the present one, which will focus on passerine migration in the Palaearctic-African system. Starting with migration across the deserts of western Central Asia (N. Bulyuk & N. Chernetsov), we will continue with the passage across the eastern Mediterranean Sea, presenting moon-watch data from the Balkan Region (P. Zehtindjiev & F. Liechti). A keynote talk by F. Spina will review the main results of the Progetto Piccole Isole in the western Mediterranean, while the second keynote talk (B. Bruderer) outlines the main output of the recent Sahara project of the Swiss Ornithological Institute. H. Schmaljohann will present an answer to one of the burning issues of Sahara crossing, the question of non-stop or intermittent migration.

BIRD MIGRATION ACROSS THE SAHARA: AN OVERVIEW OF RECENT STUDIES

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A computer simulation aiming at a better understanding of the evolution and persistence of the SE and SW flyways from Europe to Africa under different environmental conditions leads to an overview of the actual flight directions and an estimate of the quantities of migrants approaching the Sahara from southern Europe. A recent project in the western part of the Sahara used radar to reveal the actual passage of migrants overhead, while simultaneous censusing and trapping combined with behavioural and physiological studies aimed at complementary information from the ground. First results are used to examine how far the birds actually use the migratory strategies assumed by the model, and to what extent current hypotheses on Sahara crossing are confirmed, rejected, or put into perspectives. Specific subjects to be approached are (1) directions of migration, including the question of shifts during Sahara crossing, (2) intensity of migration, including a comparison with expected passage rates, (3) variation of migratory intensity, (4) diurnal course of migration in relation with non-stop and intermittent migration, (5) altitudinal distribution of migrants in relation with the profiles of the atmospheric conditions, (6) variation of species distribution between coast and inland, (7) variation of body condition and age structure between coast and inland, (8) stopover duration and refuelling, (9) phenology of passage, (10) an attempt of a synopsis leading to new challenges.

FLYING TO BREED: FACTORS AFFECTING THE GENERAL PATTERNS OF SPRING SONGBIRD MIGRATION ACROSS THE MEDITERRANEAN

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Extensive networks of ringing stations applying standardised field protocols can help investigating complex migration systems over wide geographical areas. The Mediterranean is a considerable barrier between Africa and Europe for birds flying north in spring. Since 1988, the Progetto Piccole Isole (PPI) contributes to describe songbird return movements across this ecological barrier, with over 600,000 birds of more than 200 different species ringed during the peak migration period for trans-Saharan migrants on 43 different stations. Species-specific strategies defining the region where and the time when to cross and with which amount of energy stores, lead to a high variability in migratory behaviour. Early arrival on the breeding grounds seems to be the main selective force shaping patterns of return migration and leading even to differential migration of sexes. Protandry has in fact been commonly recorded among spring migrants in the Mediterranean, and is interestingly associated with sexual dichromatism. Males have also been found migrating at faster rates than females, with the time-lag between males and females increasing with latitude of breeding areas in trans-Saharan migrants. However, within this general model of time minimization, the observed inter-specific differences in seasonality of movements and stopover strategies originate also from a series of other factors acting both in Africa and Europe. Among the factors acting in Africa, more southern wintering latitudes and the overall costs derived from complete moult on the winter quarters feature species with a later passage across the Mediterranean, while the geographical distribution of fattening habitats may explain the high inter-specific variability in physical conditions over the sea. In Europe, breeding latitude has a role in explaining the seasonality of spring movements and cavity nesting has been found to be associated with early migration. These results and others, which will be illustrated, confirm the strong influence of the forthcoming breeding season on the general patterns of return migration across ecological barriers.

WHY FEWER SIBERIAN-AFRICAN PASSERINES CROSS THE DESERTS OF WESTERN CENTRAL ASIA IN AUTUMN THAN DURING RETURN MIGRATION IN SPRING?

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A large scale project carried out in the 1980s in the desert-highland zone of western Central Asia (37°48°N and 53°78°E) showed that the nocturnal passerine migrants crossing the mountain ranges of the Hindu Kush and Tien Shan are birds wintering in India, while the populations wintering in Africa avoid crossing these highlands. Migration density of Palaearctic-African migrants between the highlands and the Caspian Sea (over the deserts of western Central Asia) is 2.6 times higher in spring than in autumn (on average, 1150 and 450 birds km night', respectively). Capture data suggest even a 5.4-fold difference. In spring, transient passerines from Africa seem to cross the deserts on a broad front, while it has been hypothesized that the bulk of autumn migrants make a detour to avoid the desert belt (Bolshakov, 2003). Trapping data and moon-watching in August and September 2003-2004 in a semi-desert location 375 km north of the Caspian Sea confirmed this hypothesis: (1) the flow of passerines heading towards African winter quarters was on average 5400 birds·km ·night which is 12 times more than over the deserts of western Central Asia; (2) most African migrants had considerable fuel stores and showed a positive average fuel deposition rate. This suggests that for these birds the deserts of Central Asia are an ecological barrier in autumn but not in

spring. In autumn, the steppes and semi-deserts to the north of the Caspian Sea provide better stopover possibilities than the Central Asian deserts.

This study was supported by the Russian Foundation for Basic Research (grant 04-04-49161)

NOCTURNAL BIRD MIGRATION IN THE BALKAN AREA: SPATIAL AND TEMPORAL DISTRIBUTION OF PASSERINE MIGRANTS

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The spatial and temporal distribution of nocturnal migration in the Balkan Region was studied during the spring and autumn seasons of 2000-2002. As the East European Flyway was only marginally touched by direct observations of night migration until now, we used the moon watching technique to record the nocturnal passage simultaneously at 39 sites in Bulgaria, SE Romania, northern Greece, and Black Sea coast of Turkey. The composition of species was registered in the course of the observations at a stopover site in NE Bulgaria. Orientation behaviour of some frequent species has been tested in orientation cages. Mean migratory traffic rate was 1600 birds*$km^{-1}h^{-1}$ in autumn and 900 birds*$km^{-1}h^{-1}$ in spring. The migration intensity was similar on an E-W and N-S gradient. Slight shifts from SSW to S during the autumn and from NNE to N during the spring coincide with the changing proportions of trans-Saharan and short distance migrants. The scatter of directions decreases in the course of migration. Flight directions were virtually opposite between seasons, but the prevalence of south directions in autumn changes to NE in spring. On a large-scale view, an interaction between topography, winds and innate directions of migrants was revealed in the pattern of seasonal migration in the Balkan region. The results indicate that a substantial proportion of nocturnal migrants along the eastern flyway cross the sea on a broad front and do not need to adjust their innate migratory direction to reach the winter quarters in Africa.

AUTUMN MIGRATION ACROSS THE SAHARA: DO PASSERINES CROSS BY NON-STOP OR INTERMITTENT FLIGHTS?

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Passerines cross the Sahara by either non-stop or intermittent flights. To ascertain the strategy used by passerines, radar studies were carried out in Mauritania during autumn migration. The southern range of the Atlas mountains, representing the last important refuelling areas before the desert crossing, are situated about 1,000 km north of the study site, the oasis Ouadâne.

If nocturnally migrating songbirds fly non-stop, first passerines should reach Ouadâne the following afternoon after roughly 20 flight hours dependent on wind conditions. The passerine wave arriving from the Atlas region would continue far into the night, but songbird density would be very low during the second half of the night. If the intermittent strategy is favoured, flights of nocturnal migrants would be restricted to night time with a distinct take-off after sunset and further birds would pass at any time of the night.

A first screening of the data indicates that overall density of songbirds varies strongly from night-to-night. Mean densities of nocturnal migrants increase during the first hours of the night, continue at varying levels at night and decrease towards the morning. This average pattern indicates prevailing intermittent migration. However, deviations from average seem to occur according to varying wind conditions. Strong northerly winds seem to favour nocturnal passerine migration far into the day, suggesting that nocturnal migrants respond opportunistically to conditions aloft to improve the crossing.

PARALLEL SESSION D2

POPULATION ALERTS FROM TREND ANALYSES

INTRODUCTION

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WATERBIRD POPULATION ALERTS FROM TREND ANALYSES AT NATIONAL, REGIONAL AND LOCAL SCALES

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The UK holds internationally important numbers of non-breeding waterbirds, and government is signed up to international obligations to protect these populations. Surveillance is essential if populations are to be managed and conserved efficiently.

Wintering waterbirds have been counted in Britain as part of the Wetland Birds Survey for over four decades and our Waterbirds Alerts System has been developed to provide a standardised method of identifying the direction and magnitude of changes in numbers at a variety of spatial and temporal scales. Species that have undergone major changes in numbers are then flagged by issuing an Alert. Alerts are advisory and must be subject to interpretation. They can be used as a trigger to direct research and subsequent conservation efforts if required.

Proportional changes in the trend in numbers over short, medium and long time-frames (5,10 and 25 years), are calculated from a smoothed trend, generated by fitting a generalized additive model to the count data, and categorised according to their magnitude and direction. The trends are calculated nationally (Great Britain, England, Scotland, Wales and Northern Ireland) and for sites for which waterbirds are designated features (e.g. Special Protection Areas, Ramsar sites). Generalized linear models are then used to determine whether site trends follow wider scale patterns in order to assess whether they are most likely being driven by wide scale or local factors and so help to focus attention on where to seek possible explanations for changes in bird numbers.

RAISING ALERTS FOR TERRESTRIAL BREEDING BIRDS IN THE UNITED KINGDOM

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Conservation policy makers need clear and up-to-date information on which populations are declining and on the magnitude of declines. We describe the system that we have developed to raise such alerts for terrestrial breeding birds in the UK. This incorporates rigorous analyses of population trends, assessment of statistical error, simple change thresholds and methods for flagging information that may be unreliable.

Estimates of long-term trends from bird population monitoring schemes are often difficult to interpret due to short-term population fluctuations and statistical error. We therefore fit generalized additive models, incorporating site effects

and a non parametric trend, directly to the census data. Bootstrapped confidence intervals show the precision of trends and change measures. Changes over specified time intervals are then compared with 25% and 50% decline thresholds. Warnings are given if change measures may be unreliable due to unrepresentative data or small samples.

We discuss ways in which these methods might be developed further, noting that there is a trade off between the desirability of retaining comparability with past alerts and the benefits of using the most up-to-date analytical methods. More parsimonious trend analysis methods might be developed if site effects could be replaced by spatially explicit models with fewer parameters.

TAKING POPULATION ALERTS ONE STEP FURTHER: MONITORING CHANGES IN SPATIAL ABUNDANCE WITH COUNT SURVEY DATA

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The monitoring of population changes by count survey programmes is currently focussed on (relative) changes in numbers. The calculated indices represent changes in total population size but give limited information on changes in distribution. Although repeated bird atlases give us information about changes in distribution they provide less or no information on changes in spatial abundance. Another problem associated with atlas projects is the time-span between consecutive atlases, often ranging from 20-30 years. Therefore we need additional information to span the time between atlases. Monitoring data very usefully fill in these gaps in time. Moreover, counts conducted as part of survey programmes also make it possible to depict changes in spatial abundance patterns over short time periods. With the aid of spatial modelling techniques bird number data collected on sample sites can be interpolated to maps with full coverage. A number of examples will demonstrate how sample data can be used to monitor spatial abundance patterns.

ASSESSING THE CONSERVATION STATUS OF UK BIRDS

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Every year the British Trust for Ornithology (BTO) provides an assessment of the conservation status of birds in the UK. The classification into groups of high, medium or low concern, influences the management of conservation policies and further studies of such species. Here we re-analyse the UK Common Birds Census (CBC) data for the Lapwing (*Vanellus vanellus*), from 1965 to 1999, within a state-space modelling framework. The local levels and local trends are estimated within a fully conjugate Bayesian approach. We compare results with an integrated analysis where census data are combined with ring recovery data. The combination of different sources of information into an integrated model allows a better description of the underlying system process, through the estimation of important demographic parameters. Unfortunately information from recovery data, although available for most species, is sometimes negligible so we have to rely only on the census data. The objectives of this work are: to estimate the population size and the decline over time, to extract enough information, from the census data, to classify the conservation status of bird species; to see what type of information we lose when the recovery data are not available. We obtained results very similar to those of the integrated analysis, thus for the purpose of classification of conservation status of bird species, the model extracts the same information but using less data. This means that similar reliable inference should be possible for the vast majority of species for which recovery data are not available.

DEVELOPMENTS IN TREND ANALYSIS FOR WATERBIRDS

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The paper will recycle, into an ecological context, some ideas developed by econometricians for economic time series data For example, the "Market Model" provides an approach used to analyse the relationship between the index for a stock market as a whole and the individual shares that compose that index. These methods decompose the "risk" of a share into "market" and "unique" risk Analogous analyses can be carried out for waterbirds, using counts of birds of a species at sites One important difference between an enonomic time series, such as share prices, and ecological time series, such as counts of birds at wetlands, is that the amount of "error" in the latter is much larger, and the methods need to be adapted to take this difference into account. The outputs provide a measure of the extent to which fluctuations at a share/site relate to factors unique to the share/site rather than to changes in the overall index. The "unique" factors can be used to set "alerts" for sites. This part of the paper will be illustrated using wader count data for British estuaries. Another theme of the paper will be a comparison of econometric indices with ecological indices designed to measure environmental health, and will extend ideas developed by Colin Bibby This part of the paper will be illustrated by a prototype index designed to measure the health of the southern Benguela Ecosystem using breeding populations of seabirds as the set of time series of information

PARALLEL SESSION D3

MEASURING NATAL DISPERSAL: CURRENT APPROACHES AND FUTURE CHALLENGES

INTRODUCTION

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Natal dispersal the movement of an individual from its birthplace to the site of first reproduction, is a key process with many causes and consequences for individuals, populations and communities. Despite its importance, our knowledge of dispersal is at best limited for most species. Obtaining reliable estimates of dispersal rates distances and timing is notoriously difficult, mainly because of great logistic challenges. These include limitations of surveys to a few study plots mainly due to time and money constraints, difficulties in recording long distance dispersal and incomplete correlation between movements of individuals and gene flow among subpopulations.

The aims of this workshop are to get an overview of currently used methods and techniques and to discuss the potential of new approaches in the study of natal dispersal. Researchers are encouraged to present their (new) methods for studying natal dispersal. We aim at bringing together as wide a range of topics as possible, including for example studies using genetic methods, radio-tracking or observational approaches as well as probabilistic techniques. We also hope that this workshop will increase the interest in and will stimulate new research programs on natal dispersal.

MEASURING NATAL DISPERSAL IN A SUB-DIVIDED ISLAND POPULATION OF BLUE TITS *Parus caeruleus* AS DISTANCE RELATED RECRUITMENT RATES

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Population structure is the final consequence of distances moved between site of birth and site of reproduction. However, the movements observed are restricted by the distribution of observers in time and space. The effects of these restrictions have to be eliminated before we can retrieve the behaviour of the species studied. By analysing the movements towards the breeding site rather than away from the site of birth, allows us to express the number of birds observed to have moved a certain distance relative to the number of nestlings ringed at those distances. Thus we can describe dispersal as recruitment rates as a function of distance. This method was applied to data on Blue Tits from the island of Vlieland. Although the overall population density and the distribution of the birds over the island have changed considerably over time, the distance dependent recruitment rates are very similar for four periods. These independent estimates of recruitment rates in the same area, allow for rigorous testing of habitat effects on dispersal behaviour. In both sexes, recruitment rates increase with distance up to the size of the woodlands (where gaps of up to 400 m are important to males, but not to females). This has important implications for the population structure and suggests that in this type of habitat the population is closer to a series of discrete sub-populations than to an isolation by distance model.

DISPERSAL AND RECRUITMENT DURING POPULATION GROWTH IN A COLONIAL BIRD, THE GREAT CORMORANT

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While the factors influencing reproduction and survival in colonial populations are relatively well studied, factors involved in dispersal among colonies and settlement decisions are less well understood. The present study investigated exchanges of Great Cormorants (*Phalacrocorax carbo sinensis*) among six colonies during the expansion period of the Danish population. We used a multistate capture-recapture model, combining multisite resightings and recoveries to examine simultaneously recruitment, natal and breeding dispersal among sites, and to estimate separately annual survival of first year, immature (from age 1 to recruitment) and breeding cormorants. Mean survival of first year birds among sites (0.50, range. 0.42-0.66) was lower than immature (0.87 ± 0.08) and breeder survival (0.90, 0.81-0.97). Dispersal of breeders seemed to rely mainly on cues associated with arrival site whereas immature birds seemed to take into account information from their natal site to a greater extent. Dispersal from a site increased with decreasing mean brood size at that site, but first-time breeders only recruited to a site where they could expect better breeding success. Dispersal was distance-dependent and immature birds dispersed longer distances than breeders. These differences underline the importance of prospecting behaviour, well-known in the recruitment and dispersal strategy of first-time breeders. Natal dispersal was higher than breeding dispersal in dense colonies only, presumably because of greater competition for food, nests and mates.

IMPROVING ESTIMATES OF JUVENILE DISPERSAL: AN ASSESSMENT OF THE AREA-RATIO METHOD AND STUDY AREA DESIGNS

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Estimates of distributions of natal dispersal distances in open populations are strongly influenced by size and shape of study areas. Some methods to improve biased dispersal include area-ratio methods based on weighting observations by sampling effort, the size and shape of the study area, and the amount and distribution of preferred habitat surrounding the study area. We used data from a large, almost closed, individually marked population of Red-cockaded Woodpeckers to examine whether an area-ratio method provides accurate or improved estimates of juvenile dispersal from smaller, nested study areas of varying size, while controlling for location. Non-aggregated study designs produced low numbers of re-sightings, yet, due to their large spatial extent, produced unbiased dispersal estimates. Aggregated sample study areas (circular or linear) achieved higher numbers of re-sightings, but produced biased dispersal estimates that were generally improved by the area-ratio method. Area-ratio corrections usually provided better estimates of median dispersal distance than raw data. Small, local studies should use an area-ratio method to improve their estimates of median dispersal distance. Non-aggregated study areas may be an effective design to increase spatial extent (and thus decrease bias) without proportionately increasing the amount of habitat sampled.

DISPERSAL AS A BEHAVIOURAL PROCESS: ANALYSING INDIVIDUAL SEARCH TACTICS

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The population-level consequences of dispersal are ultimately determined by the dispersal decisions that individuals make. However, individuals do not choose a dispersal distance. Dispersal distances are an emergent property of the interactions between individual decisions about how to search the landscape for breeding vacancies and environmental factors that determine the distribution of vacancies. Thus, to understand patterns of dispersal, one focus of study must be the search tactics that individuals use. We developed new methods and modified existing ones to quantify seven aspects of individual movement patterns during dispersal, then applied these methods to evaluate the causes of variation in dispersal in Australasian treecreepers (*Climacteridae*). Three parameters (search area, thoroughness of search, philopatry of search) were strong predictors of dispersal distances, and thus should have the greatest impact on population-level consequences. These parameters in turn were influenced by natal group size, quality of the natal territory, and age and body condition at the time of dispersal. Foray rate and timing of the first foray may also be important aspects of dispersal behaviour as they showed high levels of individual variability and were correlated with variation in the competitive environment. Building a greater understanding of behavioural tactics during dispersal will depend on the development of additional methods to quantify search tactics in a variety of species as well as the identification of unifying patterns and processes across taxa.

DISPERSAL PATHS OF YOUNG TAWNY OWLS

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Traditionally, natal dispersal is measured as the linear distance between the birth location and the place where the ringed individual it is recaptured, recovered or re-sighted as adult. Albeit indicating the final destination of the natal dispersal process, this method provides little information about the behavioural processes that caused this final pattern. Radio telemetry provides a tool to study different stages of the process of natal dispersal. However, registering individual dispersal "paths" are time consuming, since available technology usually requires that each individual radiolocation must be obtained manually. I present information from a six-year study of natal dispersal of young, radio-tagged Tawny Owls. The owls were located at short time intervals (once every day for some individuals) during the first months after independence when natal dispersal took place. I demonstrate how frequent radio tracking enables the entire process of natal dispersal to be described in detail. In addition to providing descriptive information showing that natal dispersal in Tawny Owls obviously is a stepwise process, it also enables quantitative analyses to be carried out about how different status groups of individuals might differ in various traits of dispersal behaviour.

PARALLEL SESSION D4

HYBRIDISATION

INTRODUCTION

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When two new species appear in the process of allopatric speciation, their fate is decided in secondary contact zones in one of two ways: either they coalesce as the result of introgressive hybridization or they exist as two separate evolutionary branches. The phenomenon of reinforcement (the establishment of isolating mechanisms by means of character displacement in the sympatry zone) is still a subject of debate. There are arguments "for" the existence of this phenomenon, and there are arguments "against". At our Symposium the following will be discussed: (1) The possible level of introgression of two populations of different species, which do not violate the stability of species-specific characteristics, (2) Which mechanisms promote species integrity given a hybridogenous flow of heterologous genes, (3) Examples of stabilized hybridogenous forms of birds.

Our Symposium is also intended as a means of establishing contacts between Western and East European scientists for the exchange of information and the discussion of approaches, methods, and subjects of study for possible joint investigations.

PHYLOGEOGRAPHY OF THE *Calonectris* SHEARWATERS USING MOLECULAR AND MORPHOMETRIC DATA

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Within the *Calonectris* complex, patterns in colour, size, and vocalisations support the subspecies status of the Mediterranean *C. d. diomedea* and the Atlantic *C. d. borealis* Cory's Shearwaters, and the specific status of the Cape Verde Shearwater *C. edwarsii* and the Streaked Shearwater, *C. leucomelas*. However, similarities in breeding biology and ecology and a lack of genetic analyses mean their taxonomic status remains controversial. We used both molecular and biometric data from 29 Cory's populations distributed across the Atlantic and Mediterranean, one population of Cape Verde Shearwater (Cape Verde Islands) and one from Streaked Shearwater (western Pacific Ocean), to reassess the species limits and the phylogeographic relationships. ML and Parsimony analyses on the mtDNA cytochrome-b gene grouped populations into four main clusters agreeing with their spatially segregated distributions and corresponding to the four major taxa conventionally accepted. Morphometric analyses clearly separated the two Cory's Shearwater subspecies from the Cape Verde and the Streaked Shearwater into distinct morphospecies. However, in contrast to the current classification, genetic divergence among the Cape Verde, the Atlantic and the Mediterranean clades were similar, supporting a subspecies status for the Cape Verde Shearwater. Finally, one Mediterranean population, the colony second nearest to the Atlantic Ocean, was unexpectedly grouped into the Atlantic subspecies cluster, according to both genetic and morphometric analyses. This result challenges the current view of the Mediterranean-Atlantic frontier (Gibraltar strait) as a distribution barrier between the two Cory's Shearwater subspecies.

GENETIC AND PHENOTYPIC CONSEQUENCES OF SECONDARY CONTACT BETWEEN GREAT *Parus major* AND JAPANESE *P. minor* TITS IN THE MIDDLE AMURLAND, RUSSIA

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Middle Amurland in Russia has long been considered a zone of overlap between *P. minor* and *P. major*. This zone, which formed about a hundred years ago as a result of the expansion of two species from opposite directions, has continued to broaden, especially in the past few decades due to the further eastern expansion of *P. major* (Nazarenko *et al.*, 1999). To evaluate the current state of interaction between sympatric populations we studied phenotypic *P. major*, *P. minor* and hybrids using a species-specific marker of mitochondrial DNA (Kvist *et al.*, 2003, mtDNA) and an new marker of nuclear DNA (nDNA). The proportions of nDNA- heterozygotes were equal among phenotypic *P. major* and *P. minor* (22.6% n = 203 and 24% n = 25, respectively). The proportion of birds with heterospecific mtDNA was higher in phenotypic *P. minor* (19.2%, n = 26) than in *P. major* (4.8%, n = 206). In spite of a high rate of genetic introgression, which suggests that the two contacting populations have a hybrid status, both species tend to maintain their morphological peculiarities in the zone of overlap. The difference in introgression rates detected by two independent molecular markers in phenotypic *P. major* may be attributed to the autumn migration of *P. major* (mainly, females) to the south where they form a hybrid population in northern China. This apparent population may serve as a source of the phenotypic *P. minor* which colonizes the Russian part of Amurland every spring.

TAXONOMY AND HYBRIDISATION OF THREATENED GREATER *Aquila clanga* AND LESSER SPOTTED EAGLES *Aquila pomarina*

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The taxonomic status and hybridisation of the Greater *Aquila clanga* and the Lesser Spotted Eagle *A. pomarina* was studied using molecular, morphological and ecological methods. Hybridisation between spotted eagles has a particular importance since both species are threatened and a regular interspecific hybridisation is unusual in raptors. The analysis of mitochondrial DNA in a large sample of birds within the sympatric area showed the divergence of two lineages. Complex analyses of morphological characteristics and habitats confirmed the existence of two distinct groups. The occurrence of hybrids caused an overlap in morphological characteristics, but gene flow at the taxonomic level is restricted. Hybridisation occurs regularly in spotted eagles and a large proportion of the Greater Spotted Eagles in the sympatry area are interbreeding. Hence, the hybridisation has an obviously negative impact on the Greater Spotted Eagle even in the case of limited fertility of hybrids and a lack of introgression. The possible reasons for the hybridisation include rarity of the Greater Spotted Eagle and competition for mates and territories in the Lesser Spotted Eagle. Hybridisation is strongly asymmetrical, and since larger females are more successful breeders, the Lesser Spotted Eagle males could prefer to mate with the Greater Spotted Eagle females. Despite their similar behaviour and regular hybridisation, Spotted Eagles should be treated as a separate species. According to the superspecies concept, the semispecies status seems to be most appropriate.

THE *Commixtus* FORM OF THE GREAT TIT: IS IT THE RESULT OF THE HYBRIDIZATION OF *Parus minor* AND *Parus cinereus*?

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The *commixtus* form of the Great Tit, which inhabits southeastern China, is traditionally supposed to be the result of the hybridization of the Green-backed *Parus minor* and the Gray-backed *P. cinereus*. We studied the characteristics of plumage (n = 50), songs (n = 76) and molecular structure in the mtDNA C-region (n = 42) and in the intron 2 of the mioglobin gene in nDNA (n = 15) of the *commixtus* form in the Ding-Hu-Shan Nature Reserve (Guangdong, China). The number of green feathers on the backs of these birds depends significantly on their age. Assortative mating according to the color of a bird's back was not found. The color of the *commixtus* form's tail feathers is similar to that of the Far-Eastern, Chinese and Japanese *P. minor* and significantly differs from all forms of *P. cinereus* (except *P. c. hainanus*). The song of the *commixtus* form also differs from the song of *P. cinereus*. The C-region of the *commixtus* form has the same structure as that of *P. minor*, although the C-regions of *P. minor* and *P. cinereus* differ by a 21 nucleotide replacement. The sequence of the intron 2 of the mioglobin gene in the *commixtus* form is the same as in *P. minor*. Thus we did not find any sings of a hybrid origin for the *commixtus* form. Our data confirms A.A. Nazarenko's hypothesis (1971) that the *commixtus* form is a subspecies of *P. minor*, which has lost its lipochrome pigment, according to Gloger's rule, because of living on the southernmost edge of its range

AN OVERVIEW OF CURRENT STUDIES IN HYBRIDISATION

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No abstract received

PARALLEL SESSION E1

CONTRIBUTED PAPERS (5)

THE INFLUENCE OF WIND ON BARRIER CROSSING IN OSPREYS

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We investigate how tailwinds influence the travel decisions in Ospreys crossing or about to cross a large barrier. Five Ospreys migrating between northern Europe and Africa in autumn and back in spring and crossing the Mediterranean Sea and the Sahara were followed by satellite-based radio-tracking. Crossing of these barriers is almost always non-stop, and only a single case of stopping out of 81 daily travel decisions in the desert was found. In this case the wind pattern was not extreme, though headwinds were above average. Similarly, flights across the barriers in 24 daily travel decisions

before a barrier crossing were initiated apparently regardless of wind direction and strength. Though choosing favourable winds for barrier crossings would be considered more crucial than for regular migration, the pattern shown here corresponds to the one found for the entire journey in Ospreys

FATTENING RATES IN PREPARATION FOR SPRING MIGRATION IN LEAP-FROGGING YELLOW WAGTAIL POPULATIONS WINTERING IN NIGERIA

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Leap-frog migration patterns are widespread among long distance migrants, and an understanding of their causes may provide a unique insight into the dynamics of migration. I proposed a theory to explain leap-frog migration, which attributes such patterns to variation in timing of spring migration. Populations breeding at high latitudes have a later spring migration, and may winter at relatively low latitudes to take advantage of a late spring surge in food availability, which occurs too late for low latitude breeders because of their early spring migration. The theory predicts the leap-frogging populations should fatten more rapidly while preparing for pre nuptial migration.

Data on premigratory fattening rates in a leap-frog migrant, the Yellow Wagtail *Motacilla flava* wintering in Nigeria, shows that leap-frogging populations fatten rapidly following drought breaking rainfall in central Nigeria in early April, while leap-frogged populations fatten much more slowly in northern Nigeria in mid late March. This difference corresponds with the pattern predicted by the theory, which may therefore be sufficient to explain leap frog migration in Yellow Wagtails and other species of leap-frog migrant.

STOPOVER DURATION OF PALEARCTIC PASSERINE MIGRANTS IN THE WESTERN SAHARA

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Birds on migration spend much more time on stopover sites to refuel for the next migration step than aloft, but empirical data on stopover duration are rare, especially for Palearctic trans-Sahara migrants whilst crossing the desert. During spring 2003 and 2004 the stopover durations of nine migrant passerine species were analysed in two oases in Mauritania, West Africa The application of mark-capture-recapture models revealed that in three out of four species analysed survival probability did not differ between years and the data were therefore pooled for these species Transients were detected in only five species, but not in all of them on both sites. Stopover duration was with up to 30 days surprisingly long in some species compared to other studies Models taking the initial fat load of birds on first capture into account were, with one exception, never the most parsimonious ones. This indicates that emigration after capture is not dependant on fat stores at first capture. Therefore, at least for spring migration, we cannot confirm the previous conclusion that birds arriving on stopover sites in the desert with low fat loads stay longer compared to birds that arrive with high fat loads

USING TELEMETRY DATA TO VERIFY ESTIMATIONS OF STOPOVER DURATION AFTER FIRST CAPTURE

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Recently CMR-models have been introduced for estimation of stopover duration (STD) of migrating birds. These models allow separate estimation of capture probability and probability to stay at the stopover site, respectively. Estimates derived from these models should therefore be independent of capture or resight probability of the data sampling method. However, the reliability of these estimates has never been tested so far empirically. To do so, we marked 234 Orphean Warblers (*Sylvia hortensis*) at a stopover site in the Mauritanian desert and subsequently sampled recapture and resight (colour rings) data from these birds. Simultaneously we determined true STD by following 9 radio-tagged Orphean Warblers during their stopover. We found that estimated STD was positively correlated with capture probability and true STD was about 2.5 times longer than estimated STD. Furthermore, localizations of the radio-tagged birds showed that 4 birds emigrated from the trapping area but not from the stopover site. This permanent local emigration out of the trapping site leads to an important overestimation of the percentage of transient birds. CMR models are based on the assumption that the probability to stay for another day is independent of the time, the bird has already spent at the stopover site. A violation of this assumption might be a possible reason for the large difference between true and estimated STD. We test this possibility by using simulations and discuss possible implications for sampling methods and methods of data analysis

LONG TERM CHANGES IN FAT DEPOSITION AND WING LENGTH IN PASSING SONGBIRD MIGRANTS IN A SOUTHWESTERN GERMAN STOPOVER AREA

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Recent climate change and other environmental changes have altered many aspects in the live of birds like timing of migration and breeding, amount of migration, positions of wintering and breeding areas. In the context of evolution these changes can be seen as reactions of organisms to a changing environment. Some evidence has been found that short distance migrants might show more flexibility in following these environmental changes than long distance migrants can do. In this presentation we show how two morphological traits closely connected to migratory behaviour, fat deposition and wing length (measured as feather length of primary 8), changed over the last decades in 10 species of passing songbird migrants.

Long term trends in fat deposition showed a considerable decrease in 7 species (short and long distance migrants: *Turdus merula, Phylloscopus collybita, Acrocephalus scirpaceus Sylvia atricapilla, S borin, S. curruca, Parus caeruleus*) Only in the long distance migrants (*S. borin, S curruca, P collybita, A. scirpaceus*) also wing length decreased. *Erithracus rubecula* tended to have longer wings.

These long term trends present first evidence for possible adaptations in morphological traits which are connected to migratory activity and which are likely to change when migration habits are changing. However, alternate explanations are also possible and further study is needed

NOT ONLY MALES SWITCH FLYWAYS: AN ASSESSMENT OF TEAL *Anas crecca* POPULATION BOUNDARIES AND ABMIGRATION RATES USING RING RECOVERIES

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Two flyways, North-Western European and Black Sea Mediterranean, have been described for Teal *(Anas crecca)* living in western Europe. However, the level of exchanges between those (Abmigration rates) have never been quantified. We used data from close to 9,000 ring recoveries of dead Teal initially ringed in the Camargue, Southern France, to address this question. Abmigration in ducks is generally considered to be more frequent in males, which would follow their mate to her breeding ground if they pair in winter with a female from another flyway. We found abmigration rates to be similar in males and females, with approximately 20% of Teal ringed in the Camargue (Mediterranean flyway) being subsequently recovered in the North-West European Flyway.

It may therefore be more appropriate to consider these theoretical flyways as a continuum rather than two discrete units. This has important consequences in terms of Teal conservation, since trends in population size may be different when the two actual units are merged. Because international importance status is derived after the proportion of the total population that is hosted by wintering, migration stopovers or breeding sites, considering one big rather than two smaller populations may also change our view of the most important wetlands for this species.

PARALLEL SESSION E2

CONTRIBUTED PAPERS (6)

USE OF LONG-TERM RINGING DATA TO INFER CHANGES IN POPULATION STATUS AND MIGRATORY BEHAVIOUR

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We used data from a long-term migration ringing station in southwestern Germany to examine changes in both numbers of migrants and migration stop-over behaviour over the course of roughly 3 decades. While data from ringing stations have been used in the past to infer changes in population sizes of birds, the interpretation of these analyses is typically problematic because changes in numbers of birds captured can have multiple causes. Counts of captured birds reflect both the number of birds present to be captured, as well as their daily probability of capture and the number of days that birds were present to be captured. Our primary goal was to separate these three factors, using mark-recapture analyses, and determine the degree to which changes in raw counts of birds captured reflect changes in population sizes. We analysed data for three commonly captured species, Reed Warbler *(Acrocephalus scirpaceus)*, Blackcap *(Sylvia atricapilla)*, and Willow Warbler *(Phylloscopus trochilus)*, which showed contrasting population trajectories based on examination of the raw data. After correcting the counts for variation in recap-

ture probability and stop-over duration we found that agreement between raw counts and corrected values varied from good (r = 0.72) to poor (r = 0.18), for different species. Long-term changes in counts of captured birds can reflect systematic changes in recapture probability and/or stop-over duration, in addition to systematic changes in migrant numbers.

CAN CHANGES IN AGE RATIOS EXPLAIN DECLINES IN EUROPEAN PASSERINE BIRDS?

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Many bird populations in Europe appear to be declining since the past decades. One potential reason for these declines is decreased nesting success. However, most studies that have investigated nesting success were conducted at a relatively small temporal scale, and have relatively small sample sizes such that generalizations to a larger scale are not useful. Long-term banding data provide the unique possibility to investigate if decreased nesting success influences European bird populations under the premise, that changes in juvenile/adult ratios reflect changes in nesting success. We investigated if age ratios of 6 passerine species changed between 1972 and 2003. The data used in this study were collected at the Mettnau banding station of the Max Planck Institute for Ornithology, Vogelwarte Radolfzell, in southwestern Germany. We compared the results with data from two other banding stations (Galenbeck and Reit, also operated by the Vogelwarte Radolfzell) to see if patterns were consistent among regions. A consistent decrease in age ratios within and among sites would indicate that low nesting success is at least partly responsible for a species' decline. Surprisingly, the age ratio did not change consistently with year, e.g., changes in nesting success did not seem to have an impact on any of the investigated populations. Problems in data analysis and interpretability of the results will be discussed.

POPULATIONAL TRENDS IN MOULT ADVANCEMENT IN THE ROBIN *Erithacus rubecula* DURING AUTUMN MIGRATION THROUGH THE POLISH BALTIC COAST

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The aim of this study was to show intra-seasonal variation in the number of unmoulted coverts in Robins *(Erithacus rubecula)* caught during autumn migration 2001-04 at two ringing stations located at the Polish Baltic coast. The analyses was made separately for each season and ringing station and in three categories of unmoulted coverts number: low (0-3), medium (4-5) and high (6-8); in total data on 15 000 migrants were used. Based on migration dynamics we distinguished migration waves and presented percentage distributions of unmoulted coverts categories for each wave. These distributions generally differed from the earlier waves in all seasons and at both stations (Kruskal-Wallis; post hoc Dunn's tests). The same tendencies were observed within a season: unmoulted coverts mean number fluctuated in September, but from the end of this month and in October the trend was clearly increasing. This was due to changes in frequencies of the distinguished categories – in September birds with medium number of spotted coverts comprised over 50% of all migrants, while later individuals with high number of these coverts predominated. These intra-seasonal differences in moult advancement can be explained by two phenom-

ena – subsequent migration of populations with different moult characteristics as well as less advanced moult of birds from later broods. These trends in moult advancement correspond with literature data on migration timing of Robins of different breeding origin and winter quarters and indicate that the populational differentiation plays an important role in the observed variation

DECLINES IN AFRO-PALEARCTIC MIGRANTS ACROSS EUROPE FROM 1970-2000

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Studies in various regions of Europe have shown a long-term population decline in African migrants. We used the BirdLife Birds in Europe I and II databases, which contain population trends for all breeding European species across all European countries from 1970-90 and 1990-00 respectively, to examine trends in migratory and non-migratory species and to look for changes which are consistent across the whole continent. We found that long-distance Afro-Palearctic migrants declined more than any other migratory group, conversely, Asian winterers increased significantly between 1990 and 2000. Migrants wintering in open, arid habitats in Africa showed the most pronounced decline. When analysis was restricted to European countries which contained both African and Asian migrants, this relationship was consistent, suggesting that these trends are not explained by differences in quality of breeding habitat within Europe. Our results show that the regional patterns of decline in Afro-Palearctic migrants found in other studies are consistent across the whole of Europe, have occurred for at least 30 years, are ongoing and may be linked to changes in habitat within Africa. More research on changes in wintering habitats for migrants in Africa is urgently needed

ALERTS FOR TREND ANALYSES FROM CAPTURE-RECAPTURE ANALYSES

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In this talk I address the problem of inferring a trend from count data. A trend T in population size can be expressed as $T = N2 / N1$. N_i is the true population size at time i and is usually unknown, hence, counts at time i, C_i, may be used as a proxy. A count C is related to population size N via the relation $C = N * p$, where p is detectability or, equivalently, the fraction of birds detected. When a trend is estimated from counts, $T' = N2 * p2 / N1 * p1$, time-varying detectability will introduce a bias in the perceived trend T'. In the worst case, T' may be different from 1 even for a perfectly constant population, when all that has changed in fact is detectability p.

Virtually all trend analyses make the untested assumption that $p2 = p1$, i.e., that a constant fraction of birds present are counted at all times. In this talk, I will give a few counter examples to show that p may not always be constant in animal populations. I will then present some new capture-recapture type of models that are useful to estimate abundance, and therefore trend, free of any possible distortions induced by time-varying detectability in large-scale bird monitoring programs. Most examples will be drawn from work on the national Swiss common breeding bird survey. My conclusion will be that as an insurance against spurious 'trends', detectability-corrected measures of abundance should be used whenever possible.

THE IMPORTANCE OF SPECIES SELECTION IN CALCULATING COMBINED INDICES FOR DETERMINING TRENDS OF BREEDING BIRDS

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Combined population trend indices of individual bird species are increasingly used as indicators for the state of biodiversity In general, such combined indices are not calculated on the basis of all species occurring e g. in a national territory or belonging to a particular habitat guild. The selection of particular species may, however, greatly influence the trend of a combined index. In Switzerland, we were able to calculate trend indices for 169 of 171 regular breeding birds back to the year 1990. Combined indices were produced for different groups of birds, such as threatened species and species of national conservation concern as well as for different habitat guilds. While the overall trend for all regular breeders was not affected to a great extent if a few species were left out, trends for habitat guilds in particular differed depending on which species were left out of the calculation. Leaving out species that have shown a marked decline and nowadays occur in only small numbers had a strong effect Such rare species are often not considered for combined indices However, these formerly widespread species are often good indicators for man-made changes in the environment. We argue that combined indices, in order to be representative, should be based on as high a percentage of all species as possible.

PARALLEL SESSION E3

CONTRIBUTED PAPERS (7)

INNATE IMMUNITY IS A COMPONENT OF THE PACE-OF-LIFE SYNDROME IN TROPICAL BIRDS

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We studied the relationship between a component of immune function and basal metabolic rate (BMR), an indicator of the "pace-of-life syndrome", among 12 tropical bird species and among individuals of the tropical House Wren (*Troglodytes aedon*), to gain insights into functional connections between life-history and physiology. To assess constitutive innate immunity we introduced a new technique in ecological and evolutionary immunology that quantifies the bactericidal activity of blood. This in vitro assay utilizes a single blood sample to provide a functional, integrated measure of constitutive innate immunity. We found that the bactericidal activity of blood varied considerably among species and among individuals within a species. This variation was not correlated with body mass or whole organism BMR. However, among species, bacteria killing activity was negatively correlated with mass adjusted BMR, suggesting that species with a slower pace-of-life have evolved a more robust constitutive innate immune capability Among individuals of a single species, the House Wren, bacteria killing activity was positively correlated with mass-adjusted BMR, pointing to physiological differences in individual quality on which

natural selection potentially could act. We then used this bacteria killing assay in a handicap experiment on house wrens to test the hypothesis that tropical birds, with higher adult survival and smaller clutch sizes than temperate birds, favor their self maintenance over offspring fitness when confronted with extra energy demands during reproduction

EFFECTS OF HABITAT AND WEATHER CONDITIONS ON THE GLUCOCORTICOIDS IN BREEDING BIRDS

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Repeated or prolonged stress situations may affect the fitness of birds. It is, therefore, important to know when and why a bird is stressed, especially during reproduction when parents are under high energy demands. We therefore aimed at investigating factors which might produce stress during the breeding period. We investigated whether a) the number of nestlings and b) environmental effects influence the concentration of the stress hormone corticosterone (C) in the parents We studied breeding Barn Swallows *(Hirundo rustica)* during the feeding period. The number of nestlings did not correlate with plasma C levels of the parents. However, adverse weather conditions correlated negatively with food availability and body mass and positively with C. The effect of habitat quality on plasma C-levels was studied in breeding Blue Tits *(Parus caeruleus)* on Corsica and in Southern France. The two subspecies each breed in two different habitat types, one dominated by deciduous Downy Oaks *(Quercus humilis)* rich in food and the other by evergreen Holm Oak *(Quercus ilex)* with reduced food availability Basal C concentration differed between the two subspecies, but not between habitat types However, (elevated) C levels induced by handling (stress response) were higher in tits breeding in the unfavourable evergreen oaks, suggesting a stronger reaction to adverse conditions

ELUCIDATING THE MOVEMENTS OF MIGRATORY BIRDS THROUGH THE COMBINED USE OF STABLE ISOTOPE 'SIGNATURES' AND DNA MARKERS

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For the majority of avian species, migration is a fundamental aspect of their life history. To understand the ecology of avian migration, it is important to link geographic regions used by individuals throughout the annual cycle. An important (but largely unresolved) issue when considering avian migration is the extent to which individuals from the same breeding area migrate to the same wintering area, and vice versa. The extent of this 'migratory connectivity' is difficult to estimate with conventional techniques for tracking migratory birds, such as mark-recapture. Recent advances in the development of molecular genetic markers and increasing use of chemical stable isotopes have opened up exciting new avenues for elucidating the ecology of migration. A novel approach is to combine stable isotopes with DNA markers to increase our ability to distinguish between different populations. As the first step in such an approach to understand the migration of *Turdus* species, we have used stable isotope ratios to investigate the breeding origins of Redwing *Turdus iliacus* overwintering in the UK Although this species is known to breed over a vast range, from Iceland to eastern Siberia, the extent of migratory connectivity is not known Body feathers were sampled from three populations of *T. iliacus* overwintering in the UK and a single population of

the subspecies *T. i. coburni*, which winters in Iceland. Carbon, nitrogen and hydrogen isotope ratios (‰ ^{13}C, ‰ ^{15}N and ‰ D) of the feathers were analysed via continuous-flow stable isotope mass spectrometry (CF IRMS). There was a highly significant difference in both mean ‰ D and mean ‰ ^{15}N between two of the UK redwing populations and the Icelandic population. These results indicate that this method offers potential for discriminating between redwings of different breeding origin. However, elucidating the genetic structure of each sample set through the use of microsatellite and mtDNA markers, may provide an additional level of resolution and this work is currently in progress.

SPATIAL MODELLING OF BIRD DISTRIBUTIONS IN THE UK

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The use of geostatistics by biologists to predict occurrence or relative abundance at non-surveyed sites to map the entire area of interest has increased dramatically in recent years. Because all species show some form of habitat preference, the inclusion of habitat in the model is likely to improve the predictions. Using data collected through the BTO/RSPB/JNCC Breeding Bird Survey, the main tool for monitoring temporal change in breeding populations of common British birds, and CEH Land Cover Map data, which provides information on the proportion of a suite of habitat classes in each 1-km square in the UK, we explore different approaches to using habitat information for improving predictions for unsurveyed sites. The first approach is co-kriging where the significances of each land cover class are assessed in a stepwise fashion in order to determine the model with the best fit to the data. We also consider other models (regression, neural networks) to quantify relationships with habitat, and from these analyses, interpolate across unsurveyed sites. The reliability and limitations of each approach, and the value of using distance-sampling methods to estimate absolute numbers, are discussed using working examples of species with different habitat preferences.

POST-FLEDGING SURVIVAL OF SECOND BROOD CHICKS IN THE BARN SWALLOW *Hirundo rustica*: THE EFFECT OF DATE AND PARENTAL QUALITY

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A seasonal decline of reproductive performance is documented for many single-brooded bird species. In double-brooded species the trade-offs in optimizing the timing of breeding may be even more pronounced. Time constraints may affect the performance of the second brood as well as the allocation of efforts among the two broods, and the timing of the first brood at the beginning of the season. A major problem in quantifying the fitness-relevance of the timing of breeding is that the seasonal trend may be caused or confounded by parental quality effects, namely because high quality parents breed earlier than low quality parents.

We tested the effects of timing and quality of parents on the post-fledging survival of juvenile Barn Swallows in a clutch exchange experiment with second broods. The results showed a negative seasonal trend in the post-fledging survival. However, the experimental treatment did not reveal a parental quality effect on the post-fledging survival rates. Instead, we found a positive effect of the duration of post-fledging parental care on the survival of the fledglings. Late breeders could increase the survival probability of their chicks by prolonging the period of post-fledging care late in the season, which might compensate the parental quality effect. Thus, late pairs incur costs from either increased offspring mortality.

FEMALE AGE EFFECTS ON OFFSPRING QUALITY IN THE BLUE TIT *Parus caeruleus*

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In birds, reproductive performance, measured as the number of offspring and their quality, generally increases with age during the first reproductive years. The production of better-quality young in older age may arise if older parents provide better parental care and/or strongly positively influence the performance of the progeny through maternal effects, e.g. passing antibodies and hormones. To study the relative importance of early maternal effects and post-hatching parental care we conducted an experiment in the Blue Tit. Broods assisted by a 1 y old female and an old female (2 or 3 y old), and matched in terms of equal clutch size, were paired on the day of hatching. On day 2 post-hatching, nestlings were partially cross-fostered between such pairs of broods. Additionally, a subgroup of broods paired according to female age was subject to brood size enlargement by 3 nestlings on day 2 post-hatching. This allowed to study whether young and old females are equally good dealing with increased reproductive effort. Nestling quality was assessed by body mass and tarsus length on day 14 post-hatching. Nestlings reared by old females had lower body mass than nestlings from the broods reared by young females, however, they did not differ in tarsus length. Nestlings from enlarged broods were lighter and had shorter tarsi than from control broods. Within broods offspring of young females were heavier and had longer tarsi than offspring of old females, and neither brood size manipulation nor the age of rearing female influenced the magnitude of the difference. We conclude that in the Blue Tit young females seem to be better parents than old females. They provision their nestlings better both at the early stages before hatching and during post-hatching care.

PARALLEL SESSION E4

CONTRIBUTED PAPERS (8)

PASSERINE TRYPANOSOMES: MORPHOLOGICAL HETEROGENEITY AND SPATIAL DISTRIBUTION OF VECTORS

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Trypanosomes *(Protozoa: Kinetoplastida)* belong to widely distributed bird blood parasites, transmitted by bloodsucking insects. However, information about their host and vector specificity, life cycles and species number is scarce. Black flies *(Eusimulium spp.)* have been confirmed as vectors of *Trypanosoma avium*, *T. corvi* is probably transmitted by louse flies *(Ornithomyia)*. SSU rRNA sequence of trypanosome strain isolated from mosquito *Culex pipiens* revealed that it is also a bird trypanosome. In a previous study, we have found several bird of prey species infected only with *T. avium*, while the bird host of *Culex trypanosome* was not found. Passerines as candidate hosts were caught in Pálava, Southern Moravia, Czech Republic. We examined 372 passerines of 23 species, trypanosomes were found in 80 individuals, intraspecific prevalence reaching 56% in *Coccothraustes coccothraustes*. Two morphotypes were found which differ significantly in cell length and width, and the length of the flagellum. One form is probably *T. avium*, while the other one might be a new species.

To study the influence of vector spatial distribution, bloodsucking insects were caught simultaneously at ground level and in canopy. Significant differences were found in insect abundances: black flies and biting midges are more common in canopy while mosquitoes near the ground. The height of the nest thus may influence exposure to *Trypanosoma* transmitting vectors.

EXTRA-PAIR FERTILIZATIONS AND THE STRENGTH OF SEXUAL SELECTION IN SOCIALLY MONOGAMOUS LONG-DISTANT MIGRATORY PASSERINE

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Recently it has become apparent that extra-pair fertilizations (EPFs) are widespread in socially monogamous songbirds. However, it remains unclear whether EPFs increase the opportunity for sexual selection; such an increase would only be expected if some males excel at gaining both extra-pair (EP) fertilizations and within pair (WP) paternity. Here we analyze the contribution of EPFs to variance in male fitness using long term data (2000-04) on genetic mating system of a long-distant migratory passerine, the Scarlet Rosefinch Carpodacus erythrinus. We show that: (1) rates of EPFs in this species are highest ever reported among finches; (2) standardized variance in realized apparent reproductive success of males (Ir/Ia) exceeds 3.0 (parentage assigned to 84% EP young, n = 45), (3) EP+WP success contributes most to the variance in male reproductive success; (4) there is a significant positive covariance term between those two components of male fitness, (5) breeding synchrony and nest density seem to have only subtle effects on EP success of males. Previous studies have found no evidence for sexual selection to operate through social pairing in rosefinches; based on the above data, and on comparisons of males loosing and gaining paternity at the same nests, we conclude that sexual selection acts via EP matings in this species. Our findings are in agreement with the idea that in long-distant migrants with short breeding seasons, females might compensate for a hasty or inaccurate choice of social mate using EPFs.

TRENDS IN NUMBER OF WILDFOWL *Anatidae* AND COOT *Fulica atra* WINTERING IN FRANCE BETWEEN 1987 AND 2003: IS JANUARY A SUFFICIENT REFERENCE?

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The monitoring of wildfowl and Coot numbers in France allows detecting significant trends at medium to short term, a crucial tool for management and conservation. Given the place of the country along the flyway for some species, or its role as a wintering area for others, french numbers are essential for a proper analysis of population trends at the European scale. The monitoring took place at 98 wetlands scattered all over France. Wildfowl and Coot were monitored every winter in mid December, January and February. We used Log linear Poisson regressions to estimate missing count using TRIM software. A diagnosis allows assigning the results of a TRIM analysis to one of eight possible trend classes: strong, medium or low decrease, unknown trend, stable numbers, low, medium or strong increase. Among the 20 species studied, Mallard, Coot, Pochard, Goldeneye and Shelduck showed different trends in December, January and February. Trends for

the three monthes showed a significant increase for Gadwall, Pintail, Wigeon, Shoveler, Smew, Teal, Greylag, Brent and Bean Geese, Mute Swan and Goosander. Trends for four species, on the other hand, revealed marked declines (Red-breasted Merganser, Scaup, Tufted Duck and Red-crested Pochard). National and international trends were not always in accordance, being more favourable in France for Mallard, Pintail, Shoveler, Smew, Bean and Brent Geese, and less so for Red-crested Pochard, Tufted Duck, Scaup and Red-breasted Merganser. This study illustrates the fact that December and February counts provide valuable additional information to traditional mid-January wildfowl counts. It also reveals significant differences between national and international numbers, which may constitute an alarm system at the national scale and calls for more co-ordinated research among European Ornithologists

CLIMATE-MEDIATED CHANGES IN THE DISTRIBUTION AND ABUNDANCE OF OVER-WINTERING WADERS IN EUROPE

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Changes in numbers of common wader (*Charadrii*) species over-wintering on coastal areas of northwest Europe are examined in relation to changes in climate Given the important numbers of waders hosted within Europe and current concerns about global warming, it is important to establish whether local population changes are due to climate-mediated population shifts (AUSTIN & REHFISCH, 2005) Using mid-winter count data collected over the last thirty years, we show that changes in site abundance of seven out of nine common wader species have been positively correlated with changes in temperature over the same period. This relationship is most marked at colder sites and towards the northeast of the study area. From these results, we conclude that waders are likely to become increasingly abundant along the Baltic coast, but declines may occur along the Atlantic seaboard. The implications of these results for protected area selection are discussed.

EFFECTS OF AGE, BREEDING EXPERIENCE AND RECRUITING AGE ON BREEDING PERFORMANCE OF COMMON TERNS *Sterna hirundo*

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Breeding performance differs between young and old birds owing to either the appearance and disappearance of phenotypes through differential survival (selection hypothesis) or previous breeding experience (constraint hypothesis). In this contribution we test the constraint hypothesis, while controlling for current breeding and recruiting age of individual terns

Common Terns are of particular interest, since they work near the limits of their capacity Our study was conducted in a common tern colony in the harbour area of Wilhelmshaven on the German Wadden Sea coast. Transponders allowed for registration of individuals throughout the breeding season and consecutive years by a system of antennas installed around the colony and at the nests Individual clutch size, hatching success and fledging success was measured for over 10 years. Longitudinal analyses of individual data clearly showed an increase in all breeding parameters up to 6 years of age. Furthermore, a significant change was found between inexperienced and experienced breeders in clutch size, hatching success and fledging success. Where no significant correlation of breeding parameters with age was given a clear positive correlation with experience was evident. The strength of the relationship between breeding success and age or breeding success and experience also depends on the recruiting

age. 2-year old recruits showed a lower breeding success than 3- or 4-year old recruits, but the positive relationship of breeding success and experience was stronger. We suggest that experienced birds cope better with the physiological constraints.

SEASONALITY OF RESOURCES AND NEST PREDATION INFLUENCE LIFE HISTORY TRAITS OF TEMPERATE AND TROPICAL *Sylvia* SPECIES

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Tropical and temperate birds differ distinctly in their life history traits. This could be caused by differences in seasonality of resources or in predation pressure. Since it was difficult to measure both resource availability and predation pressure in the habitat, tests of these hypotheses were limited. Additionally, detailed life history data of tropical species were rare. We used (1) remote sensing data, namely NDVI (normalized difference vegetation index), to measure fluctuations in resource availability, and (2) nest success rate to measure predation pressure. Then we tested for a relationship between these factors and various life history traits of tropical and temperate birds. To avoid phylogenetic effects, we restricted our analysis to the well studied genus *Sylvia*, which has species in temperate Europe as well as in tropical Africa. Our study indicated that differences in seasonality and predation in the habitat were the key factors for explaining variation in traits like clutch size, number of broods, annual fecundity, annual survival rate and post fledging care within the genus *Sylvia*.

HABITAT REQUIREMENT AND THE BREEDING ECOLOGY OF KRUPER'S NUTHATCH *Sitta krueperi* IN ANTALYA, TURKEY

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Habitat requirements, nest preference and breeding ecology of *Sitta krueperi* have been investigated in nest boxes and natural nest holes in Antalya. The study was conducted between 2000 and 2003. Kruper's Nuthatch uses hollowed-out nest hole made by woodpeckers or makes it itself in dead trees, choosing thick branches, or in wooden power poles. We have found 18 nest holes, 9 in Red Pine, 5 in Black Pine, 3 in cedar, and one nest hole in a power pole.

Nesting areas are situated on average at 974,44 ± 125,33 m altitude, and 26 940 ± 4,680 slope, 4 of them in flat area and 13 of them northwest, north and east face of the hillside. Nest holes were on average 11,84 ± 1,62 m from the ground and they looked south, southeast and east, usualty in middle old aged trees. Kruper's Nuthatch is found in natural forests, non-planted, middle or old aged conifer forests, Red Pine, Black Pine, cedar, and juniper, and nearly these trees maquis (especially *Querqus* sp), and broad-leaved trees like maple, (*Acer* sp.), poplar (*Populus* sp.), and plane tree (*Platanus* sp). We found that the incubation period starts by late March and lasts until late June. 15 of 250 nest boxes have been occupied by *Sitta krueperi* The nest materials were composed of very thin bands of tree cortex (66.3%), pine seeds (21.3%), bristles (5.5%), feathers (2 8%), lichens (2.5%), and nylon and cotton threads (1.3%). In the nest boxes, 83 eggs were found, among which 84.3 per cent (70 eggs) yielded offspring. 65% of the chicks (n = 54) fledged successfully. The average number of successful fledglings was about 3.6 per pair. The most important factors against the success of incubation are the cutting of dry-old trees and occupation of nest boxes by *Dryomys nitedula*, bats, insects and bees. The food supplies for the chicks in their nests were found to be *Coleoptera* (33.3%), *Lepidoptera* (13.8%), ants (4 6%) and other *Hymenoptera* (1.2%), *Homoptera* (4.6%), *Dermoptera* (3 4%), *Diptera* (3 4%), *Arachnida* (3.3%) and unidentified small insect larvas (20.7%), worms (6.9%) and seeds (5.8%).

KEEPING PACE WITH GLOBAL WARMING: LONG-TERM CHANGES IN LAYING DATES OF GREAT TITS IN EASTERN SPAIN.

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Global temperatures have increased over the past decades, and this climate change has affected the breeding ecology of birds. Many studies have shown a significant trend towards earlier laying, but fitness consequences of this advancement are still not clear. For example, while some studies have shown no changes in fledging success, others have found negative or positive relationships. In our study area (orange plantations, eastern Spain), temperatures have significantly increased during spring and summer from 1986 to 2003 (e g. by about 3 °C in April). We examined the effect of this increase of mean temperatures on the breeding performance of a great tit *Parus major* population. Mean laying date has advanced progressively since 1986 (a mean of 0.7 days per year, or about 12 days during the study period) and it was negatively related to March temperatures. Despite early laying, breeding parameters (clutch size, egg volume, number of hatchlings or fledglings per pair, breeding success and fledging body mass) have shown no long-term changes. It seems therefore that Great Tits have advanced mean laying date to keep pace with probable environmental changes triggered by the increase in temperatures. Though no measures of food phenology are available, our results suggest that, whatever the synchronization between bird and food phenology was, it remains unchanged in spite of the earlier start of the breeding activities.

EXPLORING THE EFFECTS OF A LARGE-SCALE CHANGE IN IRRIGATION SYSTEM IN ORANGE PLANTATIONS OVER GREAT TIT BREEDING PERFORMANCE

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Large-scale changes in agricultural practices are known to affect distribution, densities, and breeding performance of birds. A main change in the irrigation system, from flooding (FIS) to localized dripping (DIS), is being performed in orange plantations in eastern Spain. It was our target to explore whether this change, which probably affects composition and abundance of food for the birds, had detectable effects on the breeding performance of great tits *Parus major*. The studied population breeds in nestboxes, and each nestbox was positioned using GPS. Each grove was assigned to either FIS or DIS category and the proportion of each type was estimated in a radius of 50 m around each nest using GIS. We compared a high density (2003; 113 first clutches) and a low density year (2004, 40 first clutches). Great Tits did not select nestboxes placed in groves with different irrigation system when density was high, but more clutches than those expected by chance were placed in FIS groves in the low-density year. As far as we could see from only two years, this was not due to differential survival of adults from each type of grove from 2003 to 2004, but to a movement of some individuals from DIS to FIS groves. However, we could not detect any effect of the proportion of area irrigated by each system around the nest on breeding performance. Therefore, though the birds seem to prefer groves irrigated by flooding, we were unable to determine why. Studies are in progress to look for effects on bird's health and survival.

OLFACTORY RECEPTION IN SMALL PASSERINES: EXPERIMENTAL PROOFS

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The experiments on three *Passeri*form species (Great Tit *Parus major*, Blue Tit *P. caeruleus*, and Nuthatch *Sitta europaea*) carried out in November-April 2000–2004 provided possible ethological criteria indicating that *Passer*ine birds are able not only to perceive odours, but also to learn them and use in the food search. Substances with both olfactory (vanillin and odorants of *Pelargonium odoratissimus* plant) and complex effect on the olfactory and trigeminal nerve receptors (menthol) were used in experiment. The birds were accustomed to the food impregnated with odorant in the pre-experimental period and then offered multicellular feeders with a paper cover and food marked with odorants (test) and unmarked food (control) concealed in a single cell. In one-minute attempt, Great Tits detected vanillin-marked food in 90 % of cases, pelargonium marked in 95%, menthol-marked in 86%, and unmarked in 80% of cases. The results of Blue Tits were, respectively: 91%, 89%, 88%, and 67%. Nuthatches found pelargonium-odorated food in 89% of cases and unmarked food in 52% of them. The birds were much more successful in their search for food marked with olfactory-active substances, then with complex ones and, all the more, with no odorants ($p < 0.01$ in all cases). Although every species showed individual differences, general tendencies were revealed in perception of each odour, while in control tests with unmarked food all birds searched at random. Abilities of the study species to perceive and use odour cues in their foraging behaviour did not significantly alter in the period with no plant vegetation.

AREA AND SHORELINE COMPLEXITY AFFECT WHITE-HEADED DUCK DISTRIBUTION AND ABUNDANCE IN SOUTHEASTERN SPANISH WETLANDS

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The White-headed duck *Oxyura leucocephala* is an endangered species, and most of the western European population concentrates in Spain. El Hondo Natural Park (southeastern Spain) held most of the Spanish population during the last years. It is unknown, however, why this concentration occurs, since many other wetlands, apparently adequate for the species, are available in this region. Knowledge about features important for the species to select a particular wetland would be desirable to manage other waterbodies. We studied 4 wetlands in southern Alicante, including 10 waterbodies ranging 7-508 ha. Between 1993 and 2004, five census per year (Jan, Apr, Jun, Sep, Nov) were performed at each site. From aerial photographs, we estimated the area of free water of each waterbody, and also the shoreline development index (SDI), which gives an idea of the complexity of the shoreline, with a circle having the minimum value. The probability of presence of White-headed Ducks was positively related to both waterbody area and SDI, except in Nov, where only the area was important. The number of White-headed Ducks present in a particular waterbody increased with SDI in Apr, Jun and Sep, with area in Nov, and with both area and SDI in Jan. Therefore, both variables are important to explain White-headed Duck distribution, but waterbodies with a complex shoreline seem to be preferred around the breeding period, while those with a large surface of free water are preferred during the non-breeding period.

BIRDS OF INDUSTRIAL WETLANDS OF CENTRAL RUSSIA: AFFINITY AND RISK

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In the mid-1990s in the framework of the project "*Birds of industrial wetlands*" different kinds of purifiers (water sewage, ore mining and processing enterprises, pulp and paper industry, nuclear power station, metallurgical and foodstuffs plants) of Central Russia were investigated. Industrial wetlands of Moscow, Tula, Kaluga, Kurskaia, Lipetskaia and Nijegorodskaia regions, Chuvashia, Mordovia and Marii-El first of all attract nesting colonial birds, especially Black-headed Gull (*Larus ridibundus*). Gulls protect their colonies and promote breeding of other birds, especially ducks and waders. Together they form about 60% of species diversity. The total number of species sometimes is more than 160 or 65% of regional avifauna (Moscow). Diversity of *Passer*iformes runs up to 64.4% of avifauna (Kursk). Density of birds' distribution can reach 1026 (Tula) and 2850 (Marii-El) specimens per square km. Artificial refuges form the important stopovers for waterfowl and waders. At the same time they are dangerous for birds. Teals (*Anas crecca*) sometimes perish at Kaluga when they get dirty of silt. Breeding Common Terns (*Sterna hirundo*) in Chuvashia and Moscow loose their clutches during mud discharge, but don't stop nesting. Their number increased three times in 15 years. Artificial swamp drainage led to the Little Gull (*Larus minutus*) and White-winged Tern (*Chlidonias leucoptera*) disappearing from the fauna of Chuvashia. Juvenile mortality in gulls at Marii El pulp and paper industry purifiers runs up to 15% in comparison with 3% at the natural water bodies. Industrial wetlands at the same time have the high level of risk and affinity for birds. They complete and even substitute the impoverished natural communities and enrich the regional fauna by new species.

"ECOLOGICAL TRAPS" AND WATERFOWL SYNURBIZATION IN MOSCOW

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The problem of birds' synurbization is closely connected with the local climate and habitat changing, which forms different kinds of "ecological traps" and attracts many bird species in winter and summer. This makes the urban fauna more diverse, but not with the same perspectives for the different species. Over twenty years (1985-2005) breeding waterfowl of Moscow was counted during July and wintering ones – during the middle of January. Eight species of waterfowl formed urban groups due to the presence of water sewage purifiers (0.03% of the city), where in 1970s' the big colony of Black-headed Gulls (*Larus ridibundus*), about 10 thousands of birds, had developed. This attracted hundreds of breeding Mallards (*Anas platyrhynchos*), Garganeys (*Anas querquedula*), Shovelers (*Anas clypeata*), Tufted Ducks (*Aythya fuligula*), Pochards (*Aythya ferina*), Coots (*Fulica atra*), Moorhens (*Gallinula chloropus*). In 1995 one brood of Gadwall (*Anas strepera*) was observed. Besides purifiers were an important stopover site for thousands migrant waterfowl and waders. Purifiers were destroyed by 2002. Simultaneously about ten new gull colonies together with the groups of breeding ducks have formed inside the city and along the Moscow Circle Road. Later a few colonies in the western part of Moscow were degraded and breeding Tufted Ducks' number gradually decreased from 50 to 20-25 broods per season. Pochards and Coots breed only in two gull colonies (3-6 broods per season). Shovelers and Garganeys declined in their numbers by 1-2 broods per season. Gadwall disappeared from the city. Artificial refuges play a role of the "ecological traps" for the most species of waterfowl. On the contrary, such species as Mallard, Moorhen and Tufted Duck were able to run off this traps and colonize the numerous water bodies of Moscow.

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DIFFERENT LIFE STRATEGIES OF TWO WATERFOWL SPECIES INTRODUCED IN MOSCOW

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In addition to a large group of mallards (AVILOVA, EREMKIN, 2001), Moscow provides breeding and wintering grounds for Ruddy Shelducks (*Tadorna ferruginea*) and Common Goldeneyes (*Bucephala clangula*). Both species were introduced there (released in the Zoo) in the 1950s. Ruddy Shelducks started nesting in the city already in 1956, while Goldeneyes only in 1975. The numbers of both species have been increasing since then, but the rate of population growth differed: it was much higher in Ruddy Shelducks, particularly in the last years (from 105 in 1998 to about 400 in 2005). All Ruddy Shelducks winter in the Zoo and breed outside it, nesting in the attics of high-storey buildings and rearing broods on the city ponds. For half a century no birds left the city neither in autumn, nor in spring; the situation may have changed in recent years, though we have no reliable proofs for it. Goldeneyes breed in the Zoo as well as outside it in the natural tree holes and winter mostly on the city rivers. Some of them are believed to leave Moscow in autumn and migrate to western Europe (OSTAPENKO *et al.*, 1989), while other may come to the city for the breeding season from the wintering grounds located elsewhere. The number of Goldeneyes counted in Moscow in summer remained relatively stable (about 90 adults and 70–100 ducklings) in 1998–2004, while their winter numbers have grown from 5 in 1998 to 182 in 2004. Some changes in the territorial, aggressive and brood rearing behaviour of the introduced birds compared to those of the natural populations have been also observed in the both species (POPOVKINA, 1999; ZARUBINA, 2003).

PHOTOPERIODIC REGULATION OF THE POSTJUVENILE MOULT IN THE LONG-TAILED TIT *Aegithalos caudatus*

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The Long-tailed Tit has a large distribution range, in some parts of which this species is resident, while in the others it belongs to the group of short-distance migrants. The number of migrants fluctuates greatly from year to year. Revealing the evidence of photoperiodic control of moult in such a group of migrants may give a clue to understanding their annual cycle patterns. We analysed the experimental data on postjuvenile moult of Long-tailed Tits under different photoperiodic conditions, as well as the data on free-living birds, regularly retrapped during the moult at the Ladoga Ornithological Station (NW Russia). We found that the duration and rates of postjuvenile moult in the Long-tailed Tit are regulated by day length The average duration of moult in birds kept under light conditions simulating the natural photoperiodic changes at latitude 60°° N and normally experienced by the Long-tailed Tits from early broods was 95 4 days (SE = 1.2, n = 5). The duration of moult in birds kept under light conditions experienced by the Long-tailed Tits with the latest dates of hatching was 81 days (SE = 5.4, n = 5). The difference was significant ($t = 7.06$; $p < 0.001$). The shortening of the duration of the moult resulted from more intensive and synchronous loosing of old feathers. The data from moulting birds trapped in the wild agreed with experimental results. This study was supported by the Russian Foundation for Basic Research, grant 04-04-48998

EFFECTS OF COCCIDIAL INFECTION ON BILL COLOUR AND FREE RADICALS IN BLACKBIRDS *Turdus merula*: THE ROLE OF CAROTENOID

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The level of expression of secondary sexual characters has been suggested to signal male ability to resist parasitic infestation. Particularly, carotenoid based traits have been considered as relevant signals because these pigments have immunostimulant properties. Several studies have shown that both secondary sexual traits and immune defences, can be limited by the availability of carotenoid pigments. Furthermore, recent experiments associating dietary carotenoid availability and immune challenges, have demonstrated a trade off between immune functions and sexual signalling. Carotenoid based characters may indeed appear like the plausible pathway parasite-mediated sexual selection to work. However, most studies used immune challenge to estimate immunocompetence but connection between assays of immunity and resistance to "natural" diseases is complex. Experimental infestation with true parasites may complete our view on the evolutionary trade-off between sexual signal and resistance to parasites. Using an experimental infestation with coccidian on captive male Blackbirds *Turdus merula*, within carotenoid supplemented and no supplemented birds, we have investigate whether bill colour, immune defences and resistance to free radicals were affected. In the presentation, we will discuss the results obtained from this experiment

EFFECTS OF ENVIRONMENTAL FACTORS ON BREEDING DYNAMIC OF THE GREAT CRESTED GREBE *Podiceps cristatus* IN VOJVODINA (SERBIA)

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The Great Crested Grebe (*Podiceps cristatus*) is widely distributed in Vojvodina, the northern province of the Republic of Serbia It breeds in colonies, on different types of aquatic habitats, whether they are natural, modified or artificial, running or stagnant fresh water bodies, so it presents a valid bioindicator species for the evaluation of the quality of water ecosystems. The main goal of this paper is to show in which way some environmental factors: water level and eutrofication have influences on number of breeding pairs, dynamic and breeding process of the Great Crested Grebe Data were collected from 1997-2000. Data were obtained from three natural as well as four artificial water ecosystems (fishponds with regulated water level) in Vojvodina, and were comparatively analyzed Further, we wanted to compare natural water bodies to fishponds and to affirm which of them provide better breeding, resting and feeding conditions for Great Crested Grebe At last, we wanted to show what impacts anthropogenic factors have on breeding dynamics and population density.

THE LITTLE OWL *Athene noctua* POPULATION DYNAMICS AND CURRENT TRENDS IN ARABLE LANDSCAPE IN THE WESTERN UKRAINE

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The investigations (playback method, period - from March to June) of influence of the land-use method changes during the last decades on the Little Owl *Athene noctua* population in the Ukraine were carried out in the Lviv region (Western Ukraine). 1990th were the last years of large collective farms. The Little Owl density reached 5,2 7,9 calling males [CM]/10 km² in the arable areas with farms in the period of 1990-1991. Thanks to concentration of prey and suitable nesting places the largest part of the Little Owl population was concentrated in the animal farms (6,0 9,9 CM 1 km²). The changes of the land-use structure (declining of arable fields squares) and loss of nesting places due to destroying large farms are characterized the years of 1995-1996 It caused some decline of the Little Owl population at the plots and the dispersion of those birds and probably, its migration to the cities. The processes of farmland population declining (up to 1,4 CM 10 km²) and increasing of city population (up to 6,2-8,4 CM 10 km² in the city outskirts) were noted at the same time. In the next years the Little owl population number began to increase in arable areas and its density amounted 6,1-7,4 CM/10 km2 in 2004. This Owl population number in the city has been relatively stable during the last 3 years and reached about 6-7 CM/10 km²

The dependence of Little Owl population number on the land-tenure methods was noted We suppose that the Little Owl population dynamics may feel more considerable declining in the western part of Ukraine in the case of the future land privatisation and the enlarging of arable areas on a par with intensification and modernization of agriculture

PARENTAL INVESTMENT AND CO-EVOLUTION BETWEEN ECTOPARASITES AND CHICKS OF THE NORTH AFRICAN BLACK BLACKBIRDS *Turdus merula mauritanicus*

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The Algerian Blackbird (*Turdus merula mauritanicus*) has a slightly later timing of reproduction than its European counterpart (from the beginning of March until the middle of July), but has a better reproductive success (1.088 fledglings per clutch, over an average clutch size of 3 38 eggs) Temperature is the main factor triggering the start of reproduction. Climatic conditions represent a strong

pressure to which the avian species of the southern Mediterranean have to adapt. This Blackbird subspecies is heavily infected by two sorts of Acarids which are, in order of importance, Ticks *(Ixodes ricinus)* and Mites (*Dermanyssus* sp), besides a small percentage of an Insect (a sort of flea (*Aphaniptera* sp) The Blackbird is a humicole bird, and humidity is a key factor for the development of the ticks, that are more abundant in spring (the beginning of the reproductive season) This heavy parasitic load, has no effect on weight and tarsus length of fledglings, which are not different from average values.. Nevertheless, there is a positive and significant relation between body mass of seven day old chicks (The point of flexion of the growth curve of chicks) and the load of ticks (the most abundant parasite) Besides, preliminary studies proved that the parents favour the weakest chicks during feeding. So we can conclude that young Blackbirds can avoid damages due to parasitic infections because of behavioural adjustments made by the parents

TRAPPED BETWEEN NEST LOSS AND HABITAT LOSS – CHANGING AQUATIC WARBLER HABITATS AT THE WESTERN EDGE OF THE BREEDING RANGE

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Aquatic Warblers *Acrocephalus paludicola* breeding along the lower Odra / Oder in Poland and Germany are regarded as a genetically distinct "Pomeranian population". This population is rapidly declining and nowadays restricted to secondary grassland habitats which are management-dependent. Since the species' range has shrunk drastically due to land reclamation in the past, conservation and restoration of suitable habitat is urgently required.

For the only remaining German breeding site, the Lower Oder Valley National Park, we investigated whether changes in habitat suitability contribute to the ongoing decline. We combined monitoring results with data on vegetation composition, vegetation structure, and land use

Vegetation structure at Aquatic Warbler breeding sites has undergone significant changes mainly caused by land use (i e. mowing and grazing). As a consequence the suitability of traditional breeding sites has decreased We conclude that, besides mowing during the breeding season, habitat deterioration causes problems in protecting the Aquatic Warbler breeding sites and that land use is a key factor for habitat suitability in the lower Odra / Oder valley.

USING TRACE ELEMENTS AND STABLE ISOTOPES AS BIOMARKERS OF MARINE RESOURCES IN DIET OF YELLOW-LEGGED GULLS (WESTERN MEDITERRANEAN, SPAIN)

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The Yellow-legged Gull (*Larus michahellis*) is a problematic species throughout its Mediterranean range In most cases is considered a pest species because of their interactions with human. In other cases, it is because they interact with other species, usually under protection, which can be disturbed, predated and displaced from their breeding areas

Most of the problems can be attributed to oversized populations of Yellow-legged Gulls derived from their ability to exploit a wide range of resources, particularly those derived from human activities (e.g., garbage or fishery discards). The use of biomarkers in diet studies of generalists species gives a more integrated view than the analysis of regurgitates which just give a punctual view of their diet.

During the breeding season we collected regurgitates, blood and mantle feathers of fledgling chicks to analyze trace elements (Se, Pb and Hg levels) and signatures of C, N and S stable isotopes to evaluate the dependence degree on fisheries discards and refuse dumps in four colonies of Western Mediterranean coast (Medes Islands, Ebro Delta, Columbretes Islands and Mazarrón Island). The proportion of marine resources (mostly fish) in the fledgling's diet is rather variable, from almost 100% in Columbretes Is. to only 20% in Mazarrón, being Ebro Delta and Medes Islands intermediated situations around 50%.

Our results contribute to the idea that the trace elements and stable isotopes are a useful tool on diet studies, in our case biomarkers differ on the four study areas according to the marine consumption gradient.

IMMUNOCOMPETENCE OF FEMALE COMMON EIDERS INCUBATING IN THE HIGH ARCTIC IN RELATION TO CLUTCH SIZE

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To maximize their selective value, long-lived species face trade-offs between survival and reproduction. The cost of reproduction, which is defined as the negative impact of current parental investment on chances of adult survival and future reproduction, may affect immune system function possibly through hormonal changes. The current study measures components of acquired immunity and plasma corticosterone levels of female eiders (*Somateria mollissima*) throughout the incubation period as a function of clutch size. These precocial birds lay up to six eggs and fast completely during incubation. Birds were sampled early and late in the incubation period, clutches ranging from one to four eggs. T-cell-mediated immune response and humoral immunity were assessed by phytohemagglutinin (PHA) skin tests and measurements of serum immunoglobulins, respectively. During incubation, responses to PHA injection and immunoglobulin levels significantly decreased by about 40 and 25%, respectively. This apparent immunosuppression occurred independently of the number of eggs laid by the females. Finally, corticosterone did not vary significantly during incubation whatever the clutch size. It is concluded that female eiders seem to reallocate their resources from immune function to reproductive effort whatever the clutch size and that corticosterone does not apparently mediate immunosuppression.

BEHAVIORAL STRATEGIES ADOPTED BY THE ALGERIAN BLUE TIT *Parus caeruleus ultramarinus* TO MITIGATE THE IMPACT OF THE ECTOPARASITISM

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This is the first study that makes an inventory of nest ectoparasites and evaluates their impact on the chicks in a population of North African Blue Tits. Weshowed that 80% of the nests are infected by mites (*Dermanyssus*), ticks (*Ixodes*), dipterans (*Protocalliphora*) and fleas (*Ceratophyllus*).

This heavy parasitic infestation does not seem to affect negatively the morphometric parameters of the chicks (tarsus length, mass at day 15) and has only a weak effect on mortality. This led us to

hypothesize the parents put more effort into the clutches infected by parasites to compensate, somehow, for the potential costs imposed by parasite load by increasing feeding frequenciesas well as nest attendance. This was verified by measuring feeding frequencies and the visits to the nest without prey

These results suggest that this host species presents a behavioural strategy of defence to oppose the pressures exercised by parasites

This differentbehaviour of the parents is attributed to a compromise between current and future reproduction.

BIRDS IN EUROPE AND BIRDS IN THE EUROPEAN UNION: WHAT RESEARCH IS NEEDED TO HELP HALT THE LOSS OF EUROPEAN BIODIVERSITY BY 2010?

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In November 2004, BirdLife International published Birds in Europe (BiE2, the second review of the conservation status of all European bird species) and Birds in the European Union (BiEU, the first review of their status in the EU25) BiE2 updates the information collated by Tucker & Heath (1994), and presents national population estimates and trends for 526 species across 52 territories. Like its predecessor, it identifies priority species (Species of European Conservation Concern, SPECs) in order that conservation action can be taken to improve their status. BiEU focuses on the impact of the EU Birds Directive, celebrating the 25th anniversary of this remarkable piece of European legislation and assessing its implementation and effectiveness to date.

BiE2 shows that 43% of European birds have an unfavourable conservation status in Europe, 5% more than a decade ago, while BiEU reveals that 48% of species have an unfavourable conservation status in the EU25. Given the commitment of European governments to halt the loss of biodiversity by 2010, urgent action is required, including targeted research. This paper will outline the priorities for research, such as. diagnosing the causes of population declines; quantifying the impacts of overseas factors on Europe's long-distance migrants; assessing how species' predicted future distributions can be accommodated in existing protected area networks under different climate change scenarios; identifying ecologically meaningful baselines and targets for managing protected areas; and assessing the coherence of protected area networks.

PRELIMINARY RESULTS ON THE USE OF FEEDING STATIONS BY VULTURES IN SPAIN: MANAGEMENT IMPLICATIONS.

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The Bovine Spongiform Encephalopathy (BSE) has greatly reduced the potential food supply for Spanish vulture populations. As a management tool the implementation of feeding stations (vulture restaurants) has been suggested However, feeding sites are being built up without any preliminary research on the ecology of the different vulture species considered. Knowledge of foraging areas, distribution of breeding sites and feeding areas, intra and interspecific competition and wintering grounds are essential before any conservation measure be made Preliminary results for the Griffon Vulture (*Gyps fulvus*) showed that use of vulture restaurants varied according to season and location Even food provided seemed to be a limiting factor. Age specific isolation occurs and large wintering grounds have been identified in southern Spain. The Egyptian Vulture (*Neophron percnopterus*) avoid competition with larger vulture species gathering at communal roosting sites The Black Vulture (*Aegypius monachus*) exhibited some kind of sex-segregation while food searching. Finally, the Bearded Vulture (*Gypaetus barbatus*) has greatly improved its immature survival by means of specific vulture restaurants provided mainly with bones As a conclusion the maintenance of natural habitats including traditional livestock

rearing practices is essential for the survival of spanish vultures. Vulture restaurants should be complementary to this. Furthermore, active cooperation between Local Governments related with Environmental and Agricultural affairs is urgently needed for such a species that daily exceed political boundaries. This cooperation is even needed at international scale.

FEATHERS OF AUDOUIN'S GULL CHICKS AS INDICATORS OF HG AVAILABILITY.

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The Audouin's Gull is an endemic species of the Mediterranean. The main breeding colonies are located in the Ebro Delta (NE Spain) and Chafarinas Islands (North coast of Morocco, SW Mediterranean). Feeding habits of Audouin's gulls differ between both colonies. At Chafarinas consists mainly of epipelagic fish (clupeiformes) and, on an opportunistic basis, they also consume fish discards. However, at the Ebro Delta they exploit discards from trawler fisheries (mesopelagic preys), as the main food resource. Levels of mercury have been shown to be significantly lower in epipelagic than in demersal fish as a consequence of both, their different trophic level (biomagnification) and of Hg availability, which is higher in deeper waters. Thus, the exposition to Hg compounds must be higher in gulls from the Ebro Delta. Previous analyses in primary feathers of adults from both colonies have shown that, while N and C isotopic signatures reflect the differences reported in diet, no Hg differences between colonies were detected. This lack of differences concerning Hg was attributed to the fact that p1, being the first feather moulted after breeding, is strongly influenced by the body pool of Hg accumulated during the breeding season. To overcome problems related to Hg bioaccumulation in adults, we decided to conduct the study on chicks from both localities, through the use of stable isotopes (N, C, S) and trace elements (Hg, Se and Pb) in mantle feathers. Chicks have a body pool of Hg negligible and Hg ingested is readily deposited in newly formed feathers. The present results aim to establish the relationship between resources consumed at both places and Hg availability to Audouin's Gulls living there.

ANTHOCYANINS: AN IMPORTANT AND OVERLOOKED ANTIOXIDANT GROUP IN BIRDS.

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Antioxidant compounds are very important in many stages of the life of birds. In the immune system, for example, they play a main role during virus attacks or during oxidative stress. Moreover, carotenoids, one of the main groups of antioxidants, are also very important in mate selection, being common pigments in birds' feathers. Many studies have focused on this dual role of carotenoids, considering them as the main antioxidant compounds in birds, along with Vitamin C and E. Although this is certainly true for birds feeding mainly on seeds, fruit-eating birds ingest large quantities of another group of antioxidants: anthocyanins.

The role of anthocyanins for the health of birds has not yet been studied. However, given that anthocyanins have much stronger antioxidant capacity than carotenoids, they may play a previously overlooked role in the immune system of many species.

The goal of this work was to determine whether anthocyanins are metabolised by birds and to which extent they occur in the plasma.

20 Blackcaps (*Sylvia atricapilla* L.) have

been captured with mist nets and a small blood sample has been taken from each bird prior and after feeding on Elder (*Sambucus nigra* L.) fruits We analysed tne concentrations of anthocyanins in the blood samples with a HPLC and with a mass spectrometer. We detected the presence of anthocyanins in the plasma of the birds. Anthocyanins were found in concentrations similar to those found in humans and rats after ingestion of pure anthocyanins

These results point out that antnocyanins are likely important antioxidants for fruit eating birds Their role is further investigated in an ongoing study.

WHAT KIND OF TREE HOLES ARE SAFE FOR THE COLLARED FLYCATCHER?

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In the Bialowieza Forest predator community is very rich. Therefore, it is very important for birds to find a safe nest site. The Collared Flycatcher *Ficedula albicollis*, a very numerous hole nester (up to 22p/10ha) in natural stands of the Bialowieza National Park, suffers much from predation. We tried to find out which characteristics of tree holes used by this bird affected its brood safety the most. First, following singing males the breeding holes were found, then the breeding result (successful or robbed broods) was determined. Then, the holes were measured. Comparing features of holes with successful or depredated broods, we looked for characteristics of nest holes which affected of the broods safety the most. In total data for 515 breeding holes, collected in 1989-2004, were analyzed From the seven variables only year, hole origin and placement of tne hole (trunk/limb) significantly affected nest success. Nests located in woodpecker-made holes and in limbs had higher probability of predation Also, the year of study affected the breeding success. This variation could be explain by the fact that the main predators destroying nests of the Collared Flycatcher vary in size and the manner in which they rob the nests. This are: Pine Martin *Martes martes*, Yellow-necked Mouse *Apodemus flavicollis* and Great Spotted Woodpecker *Dendrocopos major*.

TRACE ELEMENTS IN FEATHERS OF BIRDS AS NATURAL POPULATION MARKING

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The chemical body composition of birds, like that of other organisms in the biosphere, has been shown to reflect the geochemical conditions of their surroundings. The present study was designed to analyse trace elements in Snow Goose *Anser caerulescens* (60 samples) and Chaffinch *Fringilla coelebs* (152 samples) feathers with a view to identifying interpopulation differences in their content The samples of feathers were analysed in the Laboratory of Neutron Activation Analysis of the Institute of Nuclear Physics of the Uzbekistan Academy of Sciences. The results of this study indicate trace elements levels in Chaffinch feathers from different geographic populations may differ by just as much as concentrations of the same elements in Snow Goose feathers.

Conclusion: the results confirm that certain features of biochemical body composition in birds as constituent components of natural ecosystems reflect the local geochemical characteristics (both natural and man-made) of the environment. Birds of one species inhabiting different territories contain different amounts of trace elements in their feathers. In other words. concentrations of such trace elements may serve as natural population markers. The present study identified Three groups of trace elements contained in bird feathers

1) elements whose concentrations are highly specific for individual bird populations (Zn, Cu, Mn);
2) elements whose mean concentrations are signif-

icantly different between bird populations but may sometimes overlap (Co, Ni),

3) and of which the levels in bird feathers must therefore be interpreted with caution when a bird needs to be assigned to a population, 3) elements whose feather levels can by no means be used to assign birds to a population (Fe)

PHYLOGEOGRAPHY OF THE CAPERCAILLIE IN EURASIA: WHAT IS THE STATUS OF THE PYRENEAN-CANTABRIAN POPULATION ?

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The Capercaillie *Tetrao urogallus* is a keystone species of Palearctic boreal and altitude coniferous forests. With the increase of mountain leisure activities and habitat loss, populations are declining in most mountain ranges in Western Europe. A subspecies is described in each mountain range. Recent work has shown that the populations from the Pyrenees (France Spain, race *T. u. aquitanus*) and Montes Cantabricos (Spain, race *T. u. cantabrius*) survived a severe bottleneck during the 19th century, but are still considered as threatened, due to habitat fragmentation and isolation with other populations. We present an extensive phylogeographic study based on mitochondrial DNA sequence (D-loop) extracted non-invasively from faeces collected throughout the species range (from western European mountains, to central and eastern Europe, Fenno-Scandia, Russia and Siberia) We also compared our results with DNA sequences of closely-related Black-billed Capercaillie *T. parvirostris* from Mongolia. We found that populations from Pyrenees and Cantabricos were very closely related but were different of all other capercaillie populations that form an homogenous clade. Therefore, we discuss about changes in the systematics of *T. urogallus* species group where *T u. aquitanus* and *T. u. cantabrius* would be merged in a single taxon as an Evolutionary Significant Unit. This work might have important implication in Capercaillie conservation strategies for designing SPA within Natura 2000 framework.

MORPHOMETRIC CHARACTERISTICS OF THE CAECUM OF LONG-TAILED DUCK *Clangula hyemalis* WINTERING ON THE POLISH BALTIC COAST

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The caeca of 140 Long-Tailed Ducks (*Clangula hyemalis*) (87 males: 9 immature and 78 adults; 53 females· 13 immature and 40 adults) collected in 1993-2000 in the western part of the Polish Baltic coast were examined. Particular attention was paid to relationships between 4 metric characters. left caecum length (CLL); right caecum length (CRL); left caecum weight (CLW); right caecum weight (CRW) and three characters describing body size: weight (BW), length (BL), and sternum length (SL). The fluctuating asymetry (FA) in the caecum length and weight was explored by means of the fluctuating asymetry coefficient (FAC = 1-r2,, where r is the correlation coefficient of a correlation between parameters selected). Fluctuating asymetry of paired organs may reflect changes in the homeostasis of wild animals that are affected by various environmental factors; hence FAC may be a valuable proxy of the habitat quality.

The Long-Tailed Ducks examined showed mean CLL, CRL, CLW, and CRW to be 90 7 cm; 78.4 cm; 0.47 g; and 0.42 g, respectively No significant correlations between mean values of BW, BL, and SL with any of the caecum character

analysed. Length and weight asymetries of the caecum showed a pronounced pattern: the left caecum in 127 individuals (90 7%) was longer and in 115 individuals (82.1%) heavier than the right one The FAC values for the caecum length and weight were 0.472 and 0 437, respectively.

DAWN AND DUSK SINGING IN THE WREN *Troglodytes troglodytes*: A ROLE FOR TERRITORY DEFENCE?

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Intrusions of rivals into the territories of male songbirds have been shown to influence reproductive behaviour of females. Here, we investigated whether intrusions could also have long lasting effects on the territorial song of males To avoid an immediate influence of reproductive behaviour on song output, we examined autumnal dawn singing in the European Wren (*Troglodytes troglodytes*). We used song playback to simulate intrusions shortly after dawn and compared male singing behaviour immediately before and one day after the simulated intrusion Unchallenged male Wrens tended to sing more songs before than after sunrise. One day after an intrusion, however, this pattern was much more pronounced: Males significantly increased their song output before sunrise, but reduced singing after sunrise. This result suggests that dawn singing is important for territory defence Interestingly, after the intrusion, males varied less in their start of dawn singing, although the average starting time remained the same. Taken together, our findings indicate that a territorial challenge can influence singing behaviour almost 24 hours after the intrusion. To examine a possible influence of breeding activity on this territorial reaction, we repeat the experiment in spring. In that second field season, we include an additional observation day before playback as a control, to study natural variation in song output from day to day; we furthermore investigate the variation of song output at dusk.

CYTOGENETICAL EFFECTS IN THE CORNEA EPITHELIUM OF THE ROOKS *Corvus frugilegus* (L.) EYE AS THE BIOINDICATION OF ENVIRONMENTAL MUTAGENE POLLUTION.

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It is shown that the Rook inhabiting in regions of a chemical, radioactive and electromagnetic pollution results in significant changes of a Rook eye cornea epithelium condition. Individuals excerpts of the Rooks populations with the different ecological tensity have been used to determine the mutagenic effect of the polluted environment in the redioactive pollution area, in the chemical pollution region, in the complex chemical and radioactive pollution zone, in the vicinity of working high-voltage line, and in the conditionally clean area The mitotic index and the percent of cells with chromosome aberrations have been served as the tests Pathologies of cell division have been emerged in a late anaphase stage and in an early telophas stage

The fact of the Rooks inhabiting in zones of the anthropogenic pollution results in significant changes of a Rook eye cornea epithelium condition has been established. The highest frequency of damaged cells has been found in Rooks from a region with the heaviest density of the radioactive pollution and has made 11.43 + 3,61%, that was in 81,6 times higher in comparison with the control ($p < 0{,}01$). Furthermore the statistically reliable increase of the chromosome aberrations frequency has been observed at the Rooks populations under the chemical and electromagnetic environmental pollution

Researches of a level of cytogenetic disorders in a Rook inhabiting on territories polluted by chemical, radioactive and electromagnetic mutagenes is capable of using the Rook eye cornea epithelium in the capacity of a bioindicator to an estimate the environmental mutagenic pollution for the ecological monitoring purposes

WATERFOWL MONITORING IN THE WINTERING AREAS FROM THE ROMANIAN PRUT RIVER BASIN

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Beginning from the winter of 1992, we did a continuous ornithological survey in different wintering areas along the Prut River basin We studied the most important dam lakes, fishponds and some observatory points on the Prut River valley. We created a database about the trend and the actual situation of waterfowl populations in this part of Romania, identifying the best sites for birds during the cold season and monitoring the activities that disturb the birdlife, estimating the human pressure level in these areas. The wintering avifauna is formed by 100 bird species (43,85% from the total avifauna of Prut River basin - 228 species), 31 being aquatic birds - 21 species belonged to the order Anseriformes The hiemal appearance (November - February/March in the last years of our study) of Prut River basin showed thousands of geese and ducks that represents the numerically most important bird group of the winter avifauna, followed by Coot (*Fulica atra*). We followed the global contribution of these species to the total wintering waterfowl population, during the whole period of study Among them, *Anser anser* and *Anas platyrhynchos* represented super-dominant species within the hiemal population, *Anser albifrons* and *Anas crecca* were dominant species, while *Aythia ferina* reached the upper limit of the complementary species, we found significant values for *Anas penelope*, *Aythia nyroca* and *Fulica atra*

WHAT DIFFERENCES IN ENERGETICS INFLUENCE ECOLOGICAL CAPACITIES OF BIRDS?

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More than 26 species of *Passerine* birds representing the entire size range of the order (from the Goldcrest *Regulus regulus*, 5 5 g to the Raven *Corvus corax*, 1 208 g) and 16 species of *Non-Passerine* birds in the corresponding size range (25-4000 g) were chosen for analysis. New facts experimentally obtained in this study are as follows: 1. The maximal ability of birds to change their thermal conductance was determined 2. The characteristics of maximal heat loss dependent on ambient temperature were determined. 3 The relationship between the maximal existence metabolism and the maximal ability not to change evaporative heat loss was emphasized. 4 The relationship between the efficiency of metabolic energy transformation into mechanical form and the ability to change thermal conductance was established. 5. The relationship between basal metabolic rate and existence metabolism was established. 6. The evaporative water losses at different ambient temperature were determined both in *Passeriformes* and *Non-Passeriformes*. 7. The calculated non-evaporative minimal (hmin) and maximal (hmax) thermal conductance in the studied species give the following relation hmax = 4h min. 8. The basal metabolic rate in birds as a fundamental scale of their energetic power and the indicator of the maximal level of the daily work output was shown 9. The dependencies of thermal conductance from the basal metabolism were determined both in *Passeriformes* and *Non-Passeriformes* The 1.3 1.5 times increase in minimal metabolic rate level in temperate and high latitudinal *Passerine* birds results in a proportional increase in maximal existence metabolism, maximal aerobic metabolism and daily work output. For existence, a *Passerine* bird needs to increase its food intake by 30 50% or more. In *Passeriformes*, evaporative water loss is about 25 40% higher than that in *Non Passeriformes* (especially at high ambient temperatures) Supported by the RFBR grant # 03-04-48974

THE NEST ASSOCIATION BETWEEN THE TURNSTONE *Arenaria interpres* AND THE LITTLE STINT *Calidris minuta* ON NOVAYA ZEMLYA ISLAND

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Research was carried out in June 1994 on the south island of Novaya Zemlya at the North coast of the Bay of Pukchov (72° 40' N, 52° 45'). Nests of Turnstones (*Arenaria interpres*) and Little Stints (*Calidris minuta*) were founds, and their location to nearest objects, to nests of others waders and the geographic position were noted. The fate of eggs was controlled by repeated visits. 13 nests of the Little Stint were found. In 54% of them (7 nests) eggs survived up to the beginning of the hatching. From 13 nests of the Little Stint 6 were placed near to the Turnstone nests. The distance between nests of different species varied from 5 to 30 m, but all these nests of Little Stints were in the territories of Turnstones. From these nests 5 (83%) survived up to hatching, while from 7 nests of Little Stints located out of Turnstones territories only 2 (29%) survived up to hatching. The differences are significant by Chi-Square, $p < 0.05$.

Hence there is the nest association between the Turnstone and the Little Stint on Novaya Zemlya Island. Some Little Stints placed its nests at the nesting territories of Turnstones. Brooding Little Stints uses the vigilance and directly the territorial defense of Turnstones, that leads them to increase significantly the survival of eggs.

WILLOW WARBLER *Phylloscopus trochilus* LOCOMOTOR ACTIVITY RHYTHMS DURING MIGRATIONS AND BREEDING PERIODS IN THE WEST OF MOSCOW REGION

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Research was carried out during April 28 – November 7 of 1999-2004 at the Zvenigorod Biological Station (Moscow Region, Russia, 55o44 ' N, 36o51 ' E). In total 650 Willow Warblers (*Phylloscopus trochilus*) were caught by mist nets. The locomotor activity rhythms were defined on the basis of capture time. Capture time was measured with accuracy of 0,5 - 1 hour. The Willow Warbler locomotor activity rhythm has two peaks, the morning peak is more pronounced than the evening. The rhythm changes depending on stages of breeding cycle or migration. During spring migration (from 21 of April to 15 of May, in average) Willow Warbler were more active in the morning, however, the evening peak of locomotor activity was retained. In the breeding period (16 of May – 10 of July) birds were also more active in the morning; the evening peak was poorly pronounced. In brood raising and post-nesting dispersion periods (11 of July – 31 of August), the locomotor activity rhythm had three peaks. Willow Warblers were more active in the morning, but there were also the activity peak in the middle of the day, and the poorly pronounced evening peak. During autumn migration (1 of September – 6 of October, last caught bird) the locomotor activity rhythm came back to standard two–peak rhythm, with the highly pronounced morning peak and poorly pronounced evening

SEX-SPECIFIC FORAGING ECOLOGY OF ADÉLIE PENGUINS WITHIN PAIRS

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Adélie Penguin (*Pygoscelis adeliae*) biology is pretty well documented but at the scale of a pair, many questions are still to be solved. Because each member of a breeding pair is alternately foraging at sea or breeding on land, a question arises: which member of a pair invests more in reproduction? To elucidate this question, we equipped,

under general anaesthesia, both members of 5 pairs with data loggers recording body and ambient temperatures along with hydrostatic pressure and light intensity. We observed that the males hunting effort was higher than for their respective partners: 44% of dives performed by males exceeded their theoretical aerobic dive limit (110 s) vs. 22% in females. Dives were also deeper in males than in females. Both males and females reduced their foraging effort by decreasing their deep body temperature likely to save energy and to hunt longer at sea. During a trip at sea, foraging effort increased toward the end of each dive bout. Despite our small sample size we can conclude that the males invest more in reproduction than their mates.

THE INFLUENCE OF THE FOOD RESOURCES ON BREEDING REPRODUCTION OF THE RED-BACKED SHRIKE *Lanius collurio* IN EASTERN POLAND

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The aim of the study was to determine the influence of the density and biomass of invertebrates in territories of the Red-backed Shrike on clutch size and number of nestlings. The Red-backed Shrike is a well known species as regards the diet, but papers on the relation between prey availability and breeding biology are rare. Food abundance was determined on the basis of the numbers of invertebrates caught in pitfall traps in four habitats (meadows, pastures, set asides, ploughed fields) and then calculating the food abundance in territories depending on the proportion of the four types of habitats. Biomass of invertebrates was calculated on the basis of weighing the prey for each order. The territory size was assessed from area of the circles with the radius 70 m (1.54 ha) drafted around the nest of the Red-backed Shrike. The number and the biomass of invertebrates in territories did not influence on the clutch size of the red-backed shrike (Spearman's coefficient of rank correlation, $p > 0.700$). I found however the relationship between the number of invertebrates ($r_s = 0.32$, $p = 0.006$, $n = 75$), their biomass in territories ($r_s = 0.32$, $p = 0.004$, $n = 75$), and the number of nestlings in 8-9 days of their life. Results suggest that the food resources in territories have a greater influence on the nestlings number than on the clutch size.

BODY TEMPERATURE DURING EARLY BEHAVIORAL REACTIONS IN ALTRICIAL NESTLINGS

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The development of homeothermy is closely related with the development of sensory and motor capacities of the nestlings. The change of body temperature (TB) was studied in Pied Flycatcher (*Ficedula hypoleuca*) nestlings in feeding and defence behaviour. The electromyographic activity (EMG) of the pectoralis muscles (a principal site for shivering thermogenesis) and micro-thermocouple measurements revealed the growth of EMG activity during postnatal development and the age changes of TB variations at different ambient temperatures (TA) and during different behavioural patterns. The lower limit of TB when nestlings are still capable of begging was defined to be about the limit level of asymptotic curves of TB decrease in isolated nestlings at TA = 24, the latter corresponding to the lower level of adults' thermoneutral zone. Feeding response (gape, vocalization and getting of food) results in TB decrease by 1-2 °C. Satiation is accompanied by sleep and by considerable increase of TB (by 2-5 °C). Defence behaviour (freezing) that appears on day 5-6 in response to adults' alarm call is also accompanied by TB increase. The patterns of TB increase and heart rate changes during defence response are close to those in satiation phase of feed-

ing behaviour. The muscle activity was high during shivering at low TB and during freezing at high TB, when nestling appears motionless. At freezing the range of dominant frequencies of EMG was wider than at shivering. At sleeping the EMG was absent or had periodical character and low magnitude. Thus, the temperature regulation is actively involved in defence behaviour in nestlings. Supported by RFBR grants 04-04-48920, 03-04-48974 and Universities of Russia.

STATE OF POPULATION OF PASTURE BIRDS IN UKRAINE

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93 bird species in Ukraine are strictly dependent on pasture habitats. Among them, 43 species nest on pastures, 43 species use pastures for feeding, and 2 species organize a mating-place there. Plain pasture lands have the richest biodiversity (up to 78 species). In steppe pastures 11 species are identified and 2 species dwell on mountain pastures. Beofre the decline of collectivization the total area of pasture lands in Ukraine was 4,7 million of hectares, but during the last decade it has decreased significantly. This trend became obvious from second half of 1980's, when the rate of private construction works raised around cities and villages. Decrease of pastures and quality of biotopes caused a decrease in population of 14 nesting bird species. In 2002 *Numenius arquata* stopped nesting even on swamped pastures. During 1970-1980's the pastures of the Ukraine underwent the melioration. This has changed their hydrologic regime and plant populations, which in turn has led to decrese in populations of Circus pygargus, *Anas clypeata, Anas querquedula, Limosa limosa, Tringa totanus*. Unlike *Perdix perdix*, whose population has declined during last 5-6 years, the population of *Coturnix coturnix* started to grow on the pastures. The populations of *Emberiza schemiclus, Motacilla flava, Saxicola rubetra* also dropped, although the population of *Saxicola torquata* has increased in number, who nests on the slopes of ameliorative channels. Because of distribution of erosion processes the population of *Anthus pratensis* has increased on pastures. During the last 10 years the hunting on carnivorous animals was ceased in the country, and this impacts the population of birds nesting on the ground. Only in the west of the country there are 12 observations of fox burrows on the pastures. The nest populations of *Vanellus vanellus* suffered from it especially, and 2004 year was crucial one for the national population during the last 30 years. The negative impact of carnivorous animals on pasture bird populations is noticed in the last 7-8 years. Nesting sandpiper suffers from *Egretta alba, Corvus corax* and *Corvus cornix*. In Polissya region the herds of cattle are accompanied by dogs, that is limiting factor for successful nesting of sandpipers. In western regions of Ukraine more than 60 bird species use pasture ecotones for feeding or nesting. Red book species are detected in these ecosystems: *Ciconia nigra, Circaetus gallicus, Aqila pomarina, Numenius arqata, Lanius excubitor*. Bird species linked to swampy biotopes are dominated on plain pastures: *Ciconia ciconia, Vanellus vanellus, Limosa limosa, Tringa totanus, Anas clypeata, Anas querquedula*. Under current conditions there is urgent need for special management and preservation of pasture ecosystems in the country.

USE OF BIOMETRICAL DATA TO STUDY CORNCRAKE *Crex crex* POPULATION IN LATVIA

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Body size may characterize a certain group of birds according to its sex, age, geographical origin and hierarchical level. Knowledge of structure of European Corncrake *Crex crex* populations are important for planning the species conservation

In this study we analyzed biometrical data on 509 captured Corncrakes and speculated that observed patterns are attributed to population structure. During 1995-2003 Corncrakes attracted by playback of the territorial call of the male were captured. Wing length of Corncrake males in Latvia varied between 130-152mm (mean = 142.1; SD = 4.22; n = 455), tarsometatarsus length 35.0–50.0 (mean = 40.5; SD = 2.94, n = 181), and weight: 134-182g (mean = 162.8; SD = 11.1, n = 120). Significant differences ($p < 0.01$) in wing length were observed in males from Latvia and other countries. The mean value of the wing maximum length in Corncrakes captured in different habitats, increased as follows: crops < pastures < cultivated meadows < uncultivated meadows < abandoned arable land < abandoned grasslands. The differences were statistically significant ($p < 0.05$), and might reflect the hierarchy of males in habitat selection: larger males living in optimal habitats (e.g. abandoned grasslands), smaller – in suboptimal habitats (e.g. crops). Corncrake males captured in May, June, July had significant different wing lengths ($p < 0.05$). This might be explained by immigration of birds from other populations later in season, when massive hay harvest begins to the south from Latvia, causing destruction of Corncrake nests and prohibiting successful renesting in the affected territories there.

TEMPERATURES DURING THE NESTING PERIOD AFFECT POST-FLEDGING SURVIVAL IN GREAT TITS

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Survival during the first year is the most important factor determining fitness in Great Tits *Parus major*. Most studies to date show that the probability of surviving during this first year is higher for early-fledged, heavy chicks. Studies in Sagunto (eastern Spain) have shown that the effect of fledging date on survival varies much between years, so early fledging is not the best option every year. Looking for causes of this variation, we explored here the possible effects of temperatures during the nesting period and just after fledging on post-fledging survival. Data from 3148 nestlings ringed between 1992-2002 were used, and program MARK was used to estimate recapture and survival probabilities. Maximum, minimum and mean temperatures during 15 days after hatching, and 15 days afterwards (mostly early post-fledging period) for each chick were used as individual covariates in the models, along with hatching date and fledging weight. The best model suggested that the probability of survival increased with increasing fledging weight and with decreasing minimum temperatures. Therefore, the usual pattern would be for temperatures to increase, and therefore for survival to decrease, during the season. However, occasional cold or hot spells could change the seasonal pattern of survival. We hypothesize that the relation between temperatures during the nesting phase and post-fledging survival should be mediated by direct effects of temperatures on resource availability after fledging.

AUTUMN MIGRATION DYNAMICS, FAT DEPOSITION AND WING-MORPHOLOGY OF SAVI'S WARBLERS *Locustella luscinioides*

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In 1981, Birdlife Hungary at the Sumony fish pond (45 °58'N, 17 °56'E), wich is in the Southern part of Hungary in Baranya County, launched the bird-ringing project as a part of the Actio Hungarica

and late (from 1999) The South East Bird Migration Network. The autumn migration dynamics was analysed in the 1993-2002 ringed Savi's Warblers' daily captures. The population indices („chain" index) decreased from 1983 to 1992 ($R2 = 0.81$) but the size of migrating population became stable from 1983 to 2003. The dynamics of the autumn migration could be significantly different in every year (KRUSKAL-WALLIS test, $H4,330 = 29,79$, $p < 0.001$) Two migration periods can be seen in the autumn migration, before mid August and after mid-August. In these two period wing length and pointedness and 3rd primary and wing length ratios were monitored. The wing length was more significant in the second migration period (66 4 ± 1 9; 69.2 ± 2 6, $p < 0.05$) but in the wing pointedness and 3rd primary and wing length rations research did not show difference comparing the two migration periods (not-significant). The last time measured weight of the recaptured birds (15.23 ± 2 49g) and the estimated fat content (1,67±1,44) were significantly higher than in the case of the first one (14,48±1,37g, 1,07 ± 1,13, $t = 2.42$; $t = 2.61$; $df = 54$; $p < 0.05$) During the autumn migration, it was shown that Savi's Warblers in contrast to reed warblers (*Acrocephalus* spp.) get their prey on the water surface and they can be found in the reeds near the shore or over the open waters

HABITAT SELECTION AND MIGRATION DYNAMICS OF THE MIGRATING POPULATIONS OF ROBINS *Frithacus rubecula* IN THE AUTUMN MIGRATION PERIOD

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In the Bird Ringing Station at Tömörd (47°22'N; 16°41'E), located in Western Hungary, 20 km from the Alps, ringing and measurement of Robins has been carried out between 1999 and 2004 in the autumn migration period from the end of July to the mid-November according to the methods of Actio Hungarica and the SEEN. During the six years, 4099 specimens of Robins were marked and measured. The survey objective: 1. Migration dynamics analysis on the Robins' autumn migration in relation to the age-groups. 2 Identification of the role of the survey area in the migration of the Robins Median dates of the autumn migration generally fall in the first week of October. Peak migration periods are in the second half of September and in October. Average wing lengths of birds captured in the first half of August are generally the smallest (71.15 ± 1.9 mm, N = 115) while in those captured in early November these values are the greatest (72 14 ± 2 15 mm; N = 33, $F3,453 = 4.56$; $p < 0.01$). According to the wing length, migration dynamics and recovery data it is supposed that after the leaving of the local population, the northern migrating populations will emerge, however, at least two additional migrating populations are present in the autumn migration period at Tomord. These populations are the Robins from Poland and Sweden passing through in the end of September and in October as well as those from Finland and Russia passing through in the end of October and first half of November. Robins are grouping in bushy areas, the width of their habitat is small compared to other species; SIMPSON index = 1 78

PRELIMINARY STUDY ON THE DYNAMIC CICONIIFORMS SPECIES IN THE IBA CARJA - MATA - RADEANU PONDS (ROMANIA)

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The Important Birds' Area „Carja-Mata-Radeanu ponds" (code 010) is situated along the point of the confluence of Elan River with the Prut River, on the border of Vaslui and Galati counties (N 46°11'4", S 46°4' 6", E 28°8' 18", V 28°4' 3"). The IBA's territory has 1517 hectares of aquatic surfaces and around 200 ha like dams and canals Created in order to decrease the flooding risk, the

ponds are used for fisheries. The hygro-hydrophile vegetation is rich – large reedbeds surfaces, different species of Potamogeton, *Lemna*, *Polygonum*, *Myriophilum* and *Nymphoides peltata*. There are also dry meadows and riverside forests (Salix sp and *Populus* sp.). The avifauna list includes 123 birds species recorded in 1995-2005 period, between these, we recorded 12 species belonges to Ciconiiformes Order. We followed their dynamics during migration and the breeding population's trend. We recorded the presence of the Spoonbill (*Platalea leucorodia*) as a breeding species from 2003 onwards – it is the second breeding site out of the Danube Delta in Romania Among the breeding species, the Squacco Heron (*Ardeola ralloides*) has a negative population trend in the last years. For the Purple Heron (*Ardea purpurea*), we found a positive population trend

DIRECTIONS OF THE AUTUMN MIGRATION OF THREE PASSERINE TRANS-SAHARAN MIGRANTS IN BULGARIA: RESULTS FROM ORIENTATION CAGE EXPERIMENTS

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Data for the directional preferences of certain species and populations from the Balkan Peninsula are scarce. During the autumns of 2001, 2003 and 2004, we performed orientation experiments to examine the migratory directions of three species of trans-Saharan migrants, i.e. Sedge Warbler (*Acrocephalus schoenobaenus*), Great Reed Warbler (*A. arundinaceus*) and Willow Warbler (*Phylloscopus trochilus*). Using two types of cages, Emlen funnels and Busse cages, 624 birds of these species were tested at the Kalimok Field Station (41°00'N 26°26'E, NE Bulgaria). The distribution of the directions in the three species showed bimodality, with most of the birds directed in SE or SW. Nevertheless, considerable proportions of Great Reed Warblers and Willow Warblers exhibited SSE and SSW-SW directions, respectively, while almost equal numbers of Sedge Warblers were directed SE and SW. The variations of the directionality within the species studied correlated with morphometric traits; this may indicate migratory preferences of different populations. The results obtained support the hypothesis for simultaneous passage of populations with different migratory directions through the territory of the Balkan Peninsula

THE ROLE OF THE NATURA 2000 NETWORK AND AGRO-ENVIRONMENTAL PROGRAMMES IN PROTECTION OF POLISH BIRD FAUNA

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For last few years Natura 2000 has been an element of the ecological policy of Poland and the strategy of protection and sustainable use of biological diversity In the Polish proposal of the network of Natura 2000, SACs were designated for 130 bird species (29 8% of Polish bird fauna) listed in the Annex I of the Birds Directive and for migratory species not included in this Annex. However, in the proposal prepared by naturalists (proposed by NGO's) these sites were designed for 158 species and 1 subspecies (36.2% of bird fauna).

In the proposal of naturalists, SACs cover entirely or partially: 8 (i.e. 34 8%) of national parks, 16 (13.3%) of landscape parks and 119 (8.8%) nature reserves, including in total 41.5% of the area covered with the national system of protection (without areas of the protected landscape). Natura 2000 sites (SACs and SPAs jointly) in the naturalists' project cover with protection ca 18% of the area of Poland, i.e. ca twice as much as the area of present national and landscape parks and nature reserves

The implemented package of agro-ecological programmes can lead to gradual loss of unique genetic reserves. Limited choice among many variants of agro-ecological actions and subsidy rates (in particular in its incentive part) may be a great barrier to the participation (voluntary) of farmers in these programs. Thus, one would anticipate preparation and implementation of the package of financial support for these farms (mainly fishing farms), considering environmental requirements of birds, and fulfil hydrological, climatic and landscape functions.

INFLUENCE OF ANTHROPOPRESSURE ON SELECTION OF NEST-SITES IN MAGPIE *Pica pica* (L.) AND ROOK *Corvus frugilegus* (L.)

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The influence of anthropopressure on selection of nest sites has been defined based on analysis of location of 1268 nests of the Magpie *Pica pica* and 92 breeding colonies of the Rook *Corvus frugilegus* (which jointly consisted of ca 11 000 pairs) situated in urban environment and agricultural landscape of northern Poland.

The results of the study showed that the Magpie *Pica pica*: a/ situated its nests most often (63% of all nests – in the city and 57% nests – in the village) on trees located 50 m - 100 m from residential and farm buildings; b/ in the city most nests (36%) were located on *Populus* sp., while in agricultural landscape (17%) on *Alnus* sp., c/ nests were located on an average at the height: 12.9 m – in the city and 8.2 m – in the village.

In the case of the Rook *Corvus frugilegus* it was found that a/ density of breeding pairs of this species was higher in the areas where: the percentage of arable land exceeded 85%, forest coverage did not exceed 10%, soils of the highest quality class prevailed and on areas where human population was over 50 persons/km2; b/ the majority of breeding colonies were formed by Rooks in centres of small towns (68% colonies), while in large cites 62% of colonies was located in suburbs, c/ in centres of cities and villages breeding colonies were larger (on an average 102 nests) than colonies formed in suburbs (65 nests); d/ in large cities nests were located on an average at the height 19.8 m, in small towns – 16.4 m, and in villages – 15.5 m; e/ intensive human activity has a negative influence on the population size of the Rook.

REASONS OF CHANGES IN SPECIES DIVERSITY OF BIRDS OF PREY IN TUCHOLA FOREST (NATURA 2000 SITE, POLAND) IN 1902-1999.

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Tuchola Forest is a Natura 2000 site of ca 55 000 ha area – one of the largest forest complexes in Poland. It is located on the sandr plain in the basins of rivers Brda and Wda. Almost all forest communities of the Central European Lowland have been preserved there, with dominant fresh coniferous and continental swamp coniferous forests. The site includes ca 900 lakes, many wetlands and 19 types of habitats from the Annex I of the Habitats Directive. 171 bird species, including 135 breeding, have been recorded there. In the period 1902-1999, 22 species of birds of prey have been observed in the site, including: 16 species of the Accipitridae family, 5 species of *Falconidae* and 1 species of Osprey *Pandionidae*. During the past century there occurred e.g.: a/ disappearance of (previously breeding) *Circaetus gallicus*, *Aquila pomarina*, *Falco peregrinus* and *Falco tinnunculus*, b/ reduction of the list of migrants for: *Aquila chrysaetos* and *Circus macrourus*; c/ enrichment of the breeding birds fauna with *Pandion haliaetus*, *Haliaeetus albicilla and Circus pygargus*; d/ enrichment of the migratory birds fauna for *Hieraaetus pennatus*, e/ restoration of the breeding population of *Accipiter nisus* and number increase of *Circus aeruginosus*. Only the status of

Buteo lagopus, a migratory species, has not changed.

Main reasons of changes in species diversity and breeding population size of birds of prey have been too intensive forest management leading to reduction of their breeding and feeding grounds, human persecution and poaching and birds' behavioural conservatism.

ASPECTS OF PASSERINE (PASSERIFORMES) MIGRATION IN THE DANUBE DELTA (DANUBE DELTA BIOSPHERE RESERVATION)

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The purpose of our work was to analyze qualitative and quantitative dynamics of *Passerines* during migration over the Danube Delta (period 2000-04), focusing particularly on the species of genus *Acrocephalus* (Family *Sylviidae*). Geographic position, diversity and attractiveness of the Danube Delta's ecosystems attract a big number of *Passerine* species on passage. The methods we used were visual transect surveys, visual point surveys and bird captures with mist-nets. In the studied areas (Furtuna, Grindul Lupilor Vadu-Grindul Chituc from Danube Delta Biosphere Reservation) we identified 88 *Passerine* species. We observed that species diversity of Passeriformes is positively related to habitat diversity and food availability. The preference for one habitat or another is not strict for these *Passerine* species. The dominant species on passage in the Danube Delta are: *Acrocephalus scirpaceus*, *Acrocephalus schoenobaenus* and *Acrocephalus arundinaceus*. There are differences in the timing of passage of the *Acrocephalus* species, both in spring and in autumn. The autumn passage is longer than in spring. The period of passage in spring is about 60 days, while in autumn it is about 90 days. During migration, every month there are 2 or 3 "waves" of big flocks of passing birds. In spring, the adults of *Passerine* species arrive at the breeding areas earlier than juveniles, and males earlier than females. In autumn the adults leave first. These *Passerines* don't use the same migration route in spring and in autumn, towards the wintering grounds. The stopover period for Passerines in the Danube Delta Biosphere Reservation is not more than 6 days. Meteorologic conditions and resource availability influence the dynamics of migration, determining stopover period and departure time. The period of passage of *Passerines* during spring is relatively short and stopover times are smaller than those in autumn. In the three species of warblers (*Acocephalus arundinaceus*, *A. scirpaceus*, *A. schoenobaenus*) we observed a big variation of weight between the arrival day and departure day, showing that the studied areas (Furtuna, Grindul Lupilor, Vadu- Grindul Chituc) represent excellent places for rest and recovering energetic reserve for the birds after long trips during migration. The Danube Delta Biosphere Reservation is an excellent place for rest and feeding of passeriformes in migration or those that breed and is like a "bott-eneck" for migratory passeriformes.

BREEDING HABITATS OF THE EAGLE OWL *Bubo bubo* IN A PERI-URBAN AREA FROM ROMANIA

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Some Eagle Owl (*Bubo bubo*) populations breed very close to or inside human locality and other man – made landscapes. The habitats around three eagle owl nesting sites in a peri-urban area from Romania were studied. This investigation reports mainly on qualitative aspects of the habitat structure in a 1000 m radius around breeding sites. Transects, forestry maps, GPS were used. Three nesting areas (natural cliffs and calcareous quarries) were studied. They are located in a peri-urban area from Brasov town (700 m altitude, over 300 000 people) at the base of a medium sized

mountain. The minimum nesting areas distance is 2800 m, the maximum 4500 m. 8 major habitats were noted (Eunis classification) The most important are: woodlands (cover about 20% - 80%), such as: natural and artificial forests, pure, mixed, deciduous (mainly *Fagus sylvatica*) and conifer ous (*Pinus nigra, P. sylvestris, Larix deciduas* plantation etc), almost mature / old forests (mainly over 90-100 years old); open landscapes (domestic habitats, gardens, arable lands, grass-lands); man made habitats (constructed, industrial, other artificial habitats) Among the number of the habitat types no differences were found between these sites ($p > 0.05$). Further investigations are necessary near / in man made landscapes from central and eastern Europe.

NEST-SCRAPES POSITION AND FEATURE FROM TWO EAGLE OWL *Bubo bubo* BREEDING SITES IN A PERI-URBAN AREA FROM ROMANIA

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Some characteristics of four Eagle Owl (*Bubo bubo*) nest scrapes occupied in time in cliffs (3 nest-scrapes) and in a quarry (one nest scrape) were carried out in a peri-urban area from Romania (Brasov town, 700 m altitude, over 300 000 people, on the base of a medium-sized mountains). Different measurements were made for all detected nest-scrapes and other elements were noted (some based on presence/absence). The median for the maximum length of the scrape platforms is 100 cm and for the maximum height of the scrapes entrance is 146 cm. The nesting cliffs are relative high (about/exceed 20-30 m). The nests are located on both inferior or superior half of the cliff. The nests are scrapes with overhanging cliff (< 90°), one of them is almost a scrape close to a relative vertical cliff (from quarry). Comparing these two breeding sites depending on main point of direction (point of compass) of nesting cliffs and nest-sites there is a variety of directions. Among accessibility for man and mammals only one scrape is surprisingly very accessible (the nest from quarry) and other one could be accessible from flanks. Most of the nesting cliffs are well covered by trees and forests above and under them but uncovered by dense vegetation at the quarry. Such investigations are further necessary in many other man-made landscapes to know the Eagle Owl preference

THE STRUCTURE OF SONG OF THE PADDY FIELD WARBLER, *Acrocephalus agricola*

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The song structure of the Paddy Field Warbler from Kalmykia and Sea of Azov regions was studied The singing of the species could be both continuous (long songs), and discrete (short songs). The average duration of short songs is 3,8 ± 0,2 s, the length of pauses between songs -3,6 ± 0,2 s, the number of notes in one song – 18,4 ± 1,2. As a rule, each following song does not repeat previous ones. This warbler appears to posses indefinitely various repertoires of short songs, constructed on the basis of a free combination of a huge variety of initial elements (notes). Total repertoire of the populations studied consists of approximately 300 notes, repertoires of individual males: 61- 98 notes. Duration of separate notes: 16-500 ms, frequency range 2 - 7,8 kHz. Singing males avoid to repeat the same notes successively Contrary to relative rarity of serial (homotypic) duplication of individual notes, males show a strong tendency to repeat the stereotyped two-note and three-note combinations. From a quarter up to third of all notes form steady combinations to other notes. The Paddy Field Warblers show high skill in memorizing and reproducing extremely complex and strongly stereotyped vocal designs ("superphrases") including up to 30-35 notes belonging to 12-15

different types. These vocal designs can be reproduced by the male as the whole and by separate parts (phrases). According to mimetic abilities this species stands close to the most advanced acrocephaline simulators including *A. palustris* and *A. dumetorum*. The study was supported by Russian Found of Basic Researches (04-04-49602, 04-04-49276, 04-04-63061).

HEAVY METALS IN HARD TISSUES OF POCHARD AND SCAUP WINTERING IN INLAND WATERS OF NORTH-WESTERN POLAND

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Increasing environmental heavy metal pollution adversely affects birds, although neither physiological nor toxic contents of heavy metals accumulated in various parts of the body are known from most of the wild species, interspecific differences in this respect are not known either. This study was aimed at determining contents of 4 heavy metals (the physiologically indispensable iron and manganese and the highly toxic lead and cadmium) in hard tissues of representatives of the wild avifauna. The metals were assayed in dried tarsometatarsus bone and tracheal cartilage of 16 adult Scaup (*Aythya marila*) and 7 adult Pochard (*Aytha ferina*), found - in the winter of 2003-04 - entangled in fishing nets and drowned in large water bodies of north-western Poland. In both species, clearly higher contents of Fe, Mn, Pb, and Cd were recorded in the cartilage than in the bone. This could have been a result of a propensity of the metals to be more readily accumulated in the cartilage and also of the fact that the epithelium lining the internal surface of the trachea could have scavenged contaminants from the inhaled air. The birds showing more than 20 μμgPb.g in their bones were assumed highly heavy-metal affected. No such threshold level was set for the cartilage. Among the Scaup examined, two individuals contained substantial amounts of lead in their bones, four having high lead contents in their trachea, three Pochard individuals showed more than 20 μgPb/g in the trachea.

Significant interspecific differences in metal contents were revealed in the cartilage levels of Fe and Cd only, higher contents being typical of the Pochard.

WING LENGTH AS A NESTLING AGE PREDICTOR IN GREAT TIT *Parus major*

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A very small variability of the wing growth rate was found in Great Tit *Parus major* nestlings biggest among siblings (NBAS) in most nests ("normal" nests). The opposite was proved for the smallest nest mates. On the 13th day of life they differed from the biggest siblings in some nests only by 2 mm, while up to 20 mm in others. In the sample of 371 nests from Poland and N. Europe there were however 6% cases of a much retarded NBAS growth ("retarded" nests). Some of them were exposed to extremely heavy rain (the case of 0.1% of 1st broods in the Polish lowland) during first 8 days of life whereas others were found in mild, moderate or unknown weather, being probably ill or fed by one parent only. The retarded nests could usually be distinguished by emaciation and/or small brood size resulting from high nestling mortality. The NBAS wing growth did not depend on heavy rainfall after the 8th day of life and was only slightly conditioned by ambient temperatures during the first week of life (4 mm difference in wing length on the 13th day of life between nests encountering extreme temperatures). The parents' age and brood size did not influence the NBAS wing growth significantly.

Thus only the wing length of the nestling biggest in the nest should be used in the nestling ageing, and not the mean value for all nest mates Exact ageing is not possible in the broods exposed to a very heavy rainfall during the first 8 days of life and in the ones showing any disturbance in development (usually recognizable by the appearance and number of the nestlings)

NEST LOCATION AND BREEDING PARAMETERS OF THE ROOK *Corvus frugilegus*

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Colonial nesting brings costs and benefits. In particular, position of the nest can influence breeding success of the colonial birds. The aim of this study was to describe breeding parameters of the Rook in three zones of nests location A – nests on the top of a tree crown, B – nests in the middle part of a tree crown and C nests at the bottom of a tree crown. Data were collected between 1999 and 2002 in seven colonies situated in eastern Poland There were no significant differences in the mean date of egg laying, but in each season the earliest date of laying was observed in zone A, next in zone B and finally in zone C The annual mean clutch size differed significantly between zones A and C and between B and C. The mean number of nestling was the lowest in zone C and significantly differed from that in zones A and B. There were no differences in the mortality of nestlings between zones. The mortality of nestlings was probably affected by a lot of factors such as food availability. The location of nest seems unimportant for starving and growth of nestlings. In every season were not significant differences of mean number of fledglings in zone A, B and C Finally the breeding success was similar in all three zones.

EFFECT OF THE KINETIC OF THE RESTORATION OF BODY RESERVES AFTER A PROLONGED FAST ON THE LOCOMOTOR CAPABILITIES IN FEMALE MALLARDS *Anas plathyrynchos*

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In bird species periods of total food restriction may occur at specific stages of the life cycle or during harsh climatic conditions and up to 90-95% of the lipids stores and 35-45% of the body protein can be used Even if birds are able to restore lost energy reserves, little is known on the kinetics of the recovery of the lipid and protein lost and of the impact on the locomotor capabilities

To answer this question Mallards were fasted (38% body mass lost) and either sacrificed or allowed to refeed for 24h, 72h (28 and 65% of body mass recovery) or until restoration of pre-fasting body mass. Body proteins and lipids were determined as well as the power loading for flight or walking (body mass to pectoralis or leg muscle masses ratio, respectively). After 72h of refeeding, body proteins were not significantly increased ($P > 0.05$) whereas body lipid mass was nearly 4-fold increased. At that time power loading for flight or walking reached values not significantly different than in prolonged fasting- ($P > 0.05$) and significantly higher ($P < 0.05$) than in control fed birds. Significant protein and muscular accretions only occurred in the following days of refeeding. At initial body mass recovery body composition and power loading values were normalized to the ones of control fed bird. It is concluded that during early refeeding in severely depleted birds the priority is to restore lipid stores above a minimum defended threshold value This was done at the expense of the restoration of the protein stores and of the locomotor capabilities which in turn may increase the predation risk.

IMPACT OF CHANGES IN AGRICULTURAL LAND USE IN LATVIA ON THE GLOBALLY ENDANGERED GRASSLAND BIRD SPECIES – CORNCRAKE *Crex crex* (L.)

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Changes in agricultural policy, land use and management in Eastern Europe after the collapse of the soviet system had a major impact on many bird species, including Corncrake, which previously experienced dramatic declines over its range. The present study demonstrates impact of availability of various land use categories (as defined by agricultural standarts) on Corncrake population dynamics – data which are rarely found and important for conservation of the species. Corncrake population dynamics and changes in agricultural land use were studied in 68 permanent sample plots in Latvia in 1989-2004. Two night counts per season and habitat mapping were done on maps 1: 10 000. Index of Corncrake population size and indices for each habitat category in all sample plots together were calculated using program Trends for Indices and Monitoring (Statistics Netherlands). Corncrake population size were best explained by amount of specific habitat types in the sample plots: grasslands ($p < 0.002$) and abandoned agricultural lands ($p < 0.005$), negative impact had arable land ($p < 0.05$). Directional changes in habitat selection were observed over the years in some habitat types indicating on possible changes within the specific habitat type over the period of observations. Population size of Corncrakes in Latvia was calculated using habitat specific population density data and available land use statistics of the country. Data show that recent increase of the population more probably has not exceeded population size of the species in 1970-ties and has decreased to compare with 1940.

BARRED WARBLER *Sylvia nisoria* IN THE NORTH-EAST OF UKRAINE

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In the Sumy region (NE Ukraine) the Barred Warbler is very rare in Polesye and is an ussual bird in the forest steppe. This species was numerous up to the 1980's, then the population has dramatically decreased and now the species is very uncommon. Barred Warblers inhabit deciduous forests that are over grown (in 1970-1980ss – 0,32-1,0 bp/ha, in 1995-2004ss – 0,10-0,29 bp/ha), and in bushes along the edge of forest – 0,25-0,50, riverbanks willow – 0,17-0,34, dry gullies 0,08-0,40, old country cemeteries - 0,66-0,83, old neglected orchards – 0,20-0,27 bp/ha.

The spring migration of the Barred Warbler is late. An average date for 18 years of observation is the 7th of May (29th of April, 1994 and 1995 - 14th of May, 1965). From 90 nests found, 74 were built on leaf bushes and juvenile leaf bearing trees, 4 were built on juvenile coniferous trees, 7 - on rough stems of grassy plants and 5 - on dry brushwood as high as 0,06-1,80 m (in average height of 0,55 ± 0,06 m). The earliest beginning of egg laying was observed on the 11th of May 1996 and the latest beginning of laying was recorded on the 28th of June 1984. Mass laying of eggs occurs in the third decade of May. Clutch sizes were 3 eggs (twice), 4 eggs (in 10 cases), 5 eggs (in 45 cases), 6 eggs (in 4 cases) in the full clutches. On average (totally in 61 hatches it was 4,84 ± 0,07 eggs per clutch. The eggs sizes are: 18,2-23,2 x 14,3-16,5 mm, in average (N = 53) 20,77 ± 0,11 x 15,56 ± 0,06 mm. From 103 eggs (24 clutches) 82 (79,6%) hatclings have appeared, 77 (74,8%) youngs left the nests. There were 3,85 ± 0,27 hatchlings and 3,21 ± 0,38 fledglings per nests. Nest destruction and other reasons for failure made up 26 (25,2%) eggs and hatchlings, while unfertilized eggs and eggs with dead embryos were 4 (3,9%).

The last observations of individuals occurred on 9 of August, 1970 - 18 of September, 1963.

Corvidae AS THE MODEL OF SINANTROPIZATION AND URBANIZATION OF BIRDS

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Family *Corvidae* makes a major contribution to the basic sinantropic nucleus of ornito-fauna in the antropogenic habitats of the palearctic forest zone. This group could serve as a model of investigation of ornithological behavior under the increasing pressure of antropogenic factors.

The striking fact is that, while these sinantropic tendencies are characteristic of most species of *Corvidae*, urbanization of different populations went on independently and at different times. For example, Magpie underwent this process by two completely different mechanisms on Russian Far East as compared to European cities. Moreover, the most distinguished characteristic of the sinatropization process among all species of *Corvidae* is the preservation of the wild populations in the natural habitats. *Corvus corone* in the East Siberia and Russian Far East is much slower at the appropriation of the urbanistic biotops than its European counterpart *Corone cornix*.

Sinantropization of populations made it possible for many species to increase their natural habitats to North and East following the agricultural development of these territories. It's very characteristic of the urbanized populations of *Corvidae* to slow down their migration activity due to the availability of nourishment derived either from food processing leftovers or domestic junked food. This factor alone is responsible for the existence of the mass over-wintering populations of *Corvidae* in forest palearctic zone. Over-wintering populations reset their circadian rhythms in accordance with the activity rhythms of people: city lights and road traffic. Moreover, due to the spatial divergence of places where food is available and places suitable for the night-stay, there are regular circadian migrations. Finally, the most general tendency of all urbanized populations is the switch to nesting at human made structures.

VISUAL AFFERENTATION MODIFIES THE DEVELOPMENT OF ACOUSTICALLY-GUIDED DEFENSE BEHAVIOR IN PIED FLYCATCHER *Ficedula hypoleuca* NESTLINGS

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The formation of defense behavior in normally developing and visually deprived nestlings was studied in the natural habitat in response to rhythmic species typical alarm call (AC) and rhythmic tone pips. The tonal frequency of the latter was within the frequency range of AC and the repetition frequency imitated that of AC, but they did not elicite any apparent feeding or defense behavior. Behavior observations revealed that by day 10-11 of nest life normal nestlings develop the specific freezing posture (pressing into the bottom of the nest with the head below the body level) that was never observed in visually-deprived young even after their eyes were opened on day 13-14 and deprivation canceled. In control young, during the 1st half of nest period AC and rhythmic pips equally suppress begging. By day 10-11 AC totally suppresses begging while tone pips are effective only in 50% of occurrences. In most deprived nestlings, the effectiveness of AC and other used signals with respect to begging suppression decreased practically in a similar fashion. After visual deprivation had been canceled on day 12, the effectiveness of begging suppression by all studied signals increased similarly. These findings indicate the necessity of visual afferentation for the development of freezing posture and for successful learning to discriminate AC among other acoustic signals. Supported by RFBR grant # 04-04-48920.

HOW MANY DIURNAL MIGRANTS CROSS THE BALTIC SEA AT NIGHT?

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Whereas nocturnal migration across the Baltic Sea is generally thought to occur in a broad front, different spatial migration patterns occur in diurnal migrants. However, besides the obvious migration of soaring raptors along the "Vogelfluglinie" the crossing behaviour of other landbirds remains largely unexplored. Observations on visible bird migration at various offshore sites between the islands Falster and Bornholm carried out between 2002 and 2004 led us to conclude that only very few *Passerine* species cross the Baltic Sea during daytime in relatively small numbers. Low migration intensities in altitudes of up to 1,000m during daytime recorded by simultaneously operated vertical radars confirm the visual observations. Migration strategies and routes of several species can be mapped and quantified now by a combination of 1) data on breeding populations in Sweden, 2) simultaneous data on visible bird migration at coastal sites (e.g. Falsterbo, Darßer Ort), and 3) simultaneous data on bird migration offshore. Our data show that:

i) a considerable amount of diurnal migrants passes commonly at heights outside visibility (above 50 to 100 m), (e.g. swallows, Chaffinch),

ii) according to overall low mean traffic rates at heights of up to 1,000 m during daytime (as recorded by radar), a large portion of "diurnal" migrants have to cross the western Baltic at night.

INFLUENCE OF RED FOX *Vulpes vulpes* ON BIRD DIVERSITY AND ABUNDANCE IN FARMLAND – PRELIMINARY RESULTS FROM GENERAL CHLAPOWSKI LANDSCAPE PARK (WEST POLAND)

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We studied the impact of the Red Fox on bird communities occurring in farmland. The area of the Gen. Chlapowski Landscape Park is characterised by high diversity of breeding avifauna and high population densities of some species, incl. those endangered in Europe. However, a decline of some bird populations appeared since 1960s. The decline maybe explained by significant intensification of farming techniques. However, since 1970s strong increase of Red Fox population has been also recorded (in the Park – more than 5 fold), which is potential predator for birds. So, Red Fox is also potential factor contributing to decline of bird species populations.

Breeding bird density was compared for small (0.1-3ha) woodlots with (N = 11) and without (N = 30) Red Fox family dens. For bird abundance estimation a mapping method was used (9-10 counts in each woodlot from April to July in 1999-2000).

On the basis of comparison between these two groups of woodlots we have not recorded any strong differences between bird diversity and abundance which could be strictly related to presence and pressure of Red Fox. The only statistically difference dealt with group of species, which built their nest in high vegetation (tall shrubs and trees) and which is rather not potential prey of red fox. Total density of birds within this guild amounted to 6.2 p/ha for woodlots occupied by foxes and 10.9 p/ha for woodlots without fox family den (t-test, $p < 0.05$). For other groups of bird species, including those endangered by Red Fox, i.e. nesting on the ground or in low vegetation, no statistically significant differences have been recorded.

To determine finally the impact of Red Fox on birds in farmland, new project has been established for 2005-07, which will cover all main elements of farmland, i.e. crop fields, linear elements (meliorating rows etc.) and woodlots.

THE SITES AND BREEDING BIOLOGY OF SHELDUCK *Tadorna tadorna* IN THE LOIRE ESTUARY

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The breeding success and chronology of the Shelduck *Tadorna tadorna* have been monitored in the Loire estuary. Between 1987 and 2001, we made several visits a year between May and July, using a boat to observe the young all over the estuary (from Saint Nazaire to Cordemais). During the study period, we observed a total of 510 broods or nursery, corresponding to 600 broods. The results obtained in this study indicated that the average peak of hatching per year was the third of June. The average number of young per brood was also calculated. We were able to assess the total number of breeding pairs which was estimated to about 120 at the end of the period. Compared to the data collected in the seventies, the number breeding pairs showed a strong increase. However, a stable trend in number of broods and also in number of breeding pairs occurred at the beginning of the 1990's. The increase of human activities may have had a negative impact. The study allowed to localize the best sites for raising young Shelduck and the best feeding places. An adaptated management of these places is probably necessary to preserve Shelduck reproduction.

MERCURY IN THE KIDNEYS, MUSCLES, AND FEATHERS OF THE GREATER SCAUP *Aythya marila* FROM NORTH-WESTERN POLAND

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Industrialisation, application of pesticides, and grain treatment contribute to increasing mercury contamination of the natural environment. Mercury tends to be accumulated by the species situated at the top of the trophic pyramid, including many birds. Analysis of mercury levels in their tissues and feathers allows to draw direct conclusions on the metal's loading in birds' bodies and to make inferences regarding the degree of environmental contamination.

The birds used in this study were obtained during the winter of 2003-04 from north-western Poland. Assays were run on 17 adult males of the Greater Scaup (*Aythya marila*) in which mercury contents were determined, using cold vapour atomic absorption spectrometry (CV-AAS) and an AMA 254 mercury analyser, in muscles, kidneys, and feathers. The highest mercury contents were found in the kidneys and feathers (the respective geometric means 0.27 and 0.21 μg/g), the lowest content being revealed in muscles (0.09 μg/g). The kidney mercury contents was significantly correlated with those in the muscles and feathers: the SPEARMAN correlation coefficients of the kidney-muscles and kidneys-feathers correlations were 0.68 and 0.91, respectively. The mercury contents found in this study are much lower than those reported by various authors from the species and other *Anatinae* ducks from other regions of the world.

ON THE TAXONOMIC POSITION AND EVOLUTIONARY INTERRELATIONS OF THE THICK-BILLED WARBLER, *Phragmaticola aeedon* (BASED ON ECOLOGICAL AND ETHOLOGICAL DATA)

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The position of Thick-billed Warbler within the family *Sylviidae* still remains uncertain. We studied vocalization, behavior and breeding biology of the species in the Russian Far East. It is found along the forest edges, overgrowing of different bushes (especially *Sorbaria sorbifolia*), tall herbaceous vegetation and reed beds. Also it is widely distributed in agricultural landscapes including the irrigation channels, edges of roads and fields, and, especially, fire areas covered with dense and tall grass intermixed with isolated dead and green bushes. It predominantly breeds in single pairs, infrequently forming diffuse group settlements. The habitats of Thick-billed Warbler are widely overlapped with those of the Eastern Great Reed Warbler (*Acrocephalus orientalis*) and Siberian Shrike (*Lanius cristatus*). Thick-billed Warblers show strong spatial affiliation to these two species. Thick-billed Warblers place their nests in a fork of branches, instead of between parallel vertical stems. The nest construction sharply differs from *Acrocephalus* species and is similar to nests of *Sylvia* and *Hippolais* warblers. Egg shell colouring is also different. The song of Thick billed Warbler consists of a lot of various elements and is more similar to the song of *Hippolais* spp., than on songs of any *Acrocephalus* species. The frequency ranges from 0,9 up to 5,5 kHz, the presence of relatively long (300-450 ms) notes with several harmonics and complex frequency modulations is typical. In their postures, movements and flight manner Thick billed Warblers look very much like the *Sylvia* warblers and differ sharply from the *Acrocephalus* species. Thus the existing data show the Thick-billed Warbler to be well distinguished from all representatives of the genus *Acrocephalus*. The study was supported by Russian Found of Basic Researches (04-04-49602, 04-04-63061).

NESTLING VOCAL BEGGING BEHAVIOUR IN THE SPANISH SPARROW *Passer hispaniolensis* AND BROOD SIZE: PRELIMINARY RESULTS

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Begging intensity is expected to increase with brood size as a result of intra-brood competition for the resources brought by the parents. This increase should raise the risk of acoustic interference across the brood, rendering more difficult the use of acoustic signals by parents when making feeding decisions. In this study I describe the effect of brood size on nestling vocal begging behaviour in the Spanish Sparrow (*Passer hispaniolensis*) and address the possibility of that this effect might be due to a possible increase in the risk of acoustic interference. I found that the effect of brood size in nestling calling behaviour was significant. Both the vigour of the initial response and the vocal begging intensity of each nestling were lower in nests with more offspring. These results appear to support a possible effect of acoustic interference in nestling vocal begging behaviour. Nestlings in big broods showed lower call output as expected to avoid the increase of the risk of call overlap. An alternative hypothesis is that nestlings coordinate their begging, reducing their efforts, to keep the parents providing at the highest rate.

BREEDING SUCCESS OF WHITE STORKS *Ciconia ciconia* AFTER REINTRODUCTION IN ALSACE

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In the mid 1970s, the breeding populations of the migrant White Stork (*Ciconia ciconia*) were close to extinction in North East of France (Alsace). A reintroduction project, implemented with a majority of eggs and young from Maghreb, resulted in the settlement of some individuals. Both settled and migrant birds breed today in the same areas and rely on food from rubbish dumps. Since the onset of the population decline, the reproductive success decreased until today. This lower reproductive year to year may have resulted from some factors in the environment, the lower reproductive success of white storks from Maghreb and the modifications in behaviour (settled vs. migrant). The aim of this work was to test the last factor, i.e. the influence of bird behavior and of food availability (control nests vs nests near rubbish dumps) on reproductive success. For all nests, the numbers of eggs and hatchlings were higher in settled birds than in migrants, this difference resulting only from the earlier breeding of settled storks. The large broods of settled birds showed a high mortality rate, leading to the same fledgling success (fledglings/hatchlings) and number of fledglings as in migrants. Fledgling success and number of fledglings were higher for nests close to a food supply. To sum up, although settled birds can breed earlier and produce more eggs, we found no advantage in terms of number of fledglings. The higher mortality rate found in large broods could be induced by the deterioration of their habitat.

THE RELATIONSHIP BETWEEN REPRODUCTIVE SUCCESS AND PLUMAGE ORNAMENTATION IN PIED FLYCATCHER *Ficedula hypoleuca*

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The color polymorphism in male Pied Flycatcher (PF) was investigated for a long period in various approaches. Different phenotypes use various adaptive strategies, thus the balance of its frequencies could be achieved. On the other hand, previously a positive correlation has been found between plumage ornamentation (the size of white patch in wings) and the melanisation (polymorphic trait). Thus the relationship between ornamentation intensity and reproductive success is interesting. Data were collected in the National Park "Ugra" (Russia, Kaluga region). The ornamentation intensity (OI) was assessed as a sum of estimated percentage of white in each fan in large upper covers (LUC), tertials (T) and tale feathers (TF). In young males OI of LUC and T was correlated with reproduction date (RD) positively ($Rs = 0.45$, $p < 0.005$; $n = 57$ and $Rs = 0.25$; $p < 0.05$; $n = 56$ - respectively), whereas OI of TF - negatively ($Rs = -0.3$; $p < 0.025$; $n = 54$). By using multinomial stepwise regression OI of T was excluded. The OI balance (TF OI/LUC OI) when removed effect of melanisation ($k = 0.093$ $p = 0$ $n = 82$) correlated with RD ($Rs = 0.56$, $p < 0.001$ $n = 53$), as like with date when male appear in settlement in spring ($Rs = -0.33$, $p < 0.005$; $n = 67$), date of firs egg laying ($Rs = 0.56$, $p < 0.00..$, $n = 45$), clutch size ($Rs = -0.29$, $p < 0.05$, $n = 46$), own fatness at the end of period of pulli feeding ($Rs = -0.35$; $p = 0.005$, $n = 53$) and the degree of postnuptial molt at the same time ($Rs = -0.44$, $p < 0.005$; $n = 52$). Thus plumage ornamentation in young PF males is linked with reproductive success and degree of overlapping parental care and molting.

TIME MINIMIZATION DURING POSTNUPTIAL MIGRATION IN REED WARBLERS

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Optimal migration theory predicts that, during migration, birds tend to minimize duration, energetic cost and/or predation risk. In time minimizers, a positive correlation is expected between fuel deposition rate (FDR) and departure fuel load (DFL) during stopover, since birds minimize stopover duration and DFL is therefore dependent on FDR. For energy minimizers, on the other hand, DFL would be independent on FDR, since individuals should reach maximum DFL. We explored the relationship between FDR and DFL of Reed Warblers *Acrocephalus scirpaceus* captured by the end of 2004 postnuptial migration at the Pego-Oliva Marsh Natural Park (eastern Spain). There was a positive relationship between stopover duration (number of days between first and last capture) and increase in fuel load. There was also a positive curvilinear relationship between FDR and DFL. Our data suggest that Reed Warblers behave as time minimizers by the end of the postnuptial migratory period in our study area.

WHAT KIND OF NEST SITE IS SAFER FOR THE RED-BREASTED FLYCATCHER *Ficedula parva*

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Breeding success of birds depends on many factors. One of the most important is the nest site quality. Under natural conditions predation is the most important reason of the breeding losses. We tested what features of nest sites determine breeding success of the Red-breasted Flycatcher. Data were collected during five breeding seasons (2000-04) in the Bialowieza National Park (52041'N, 23052'E, NE Poland), the best preserved and strictly protected area of the Białowieza Forest. Most nests were located by observing females during nest construction or the incubation period. For all nests, we determined the height of the nest above ground, stage of tree (dead or alive), type of nest site and for some of nest depth and bottom area. Three types of nests sites were distinguished: half hole, chimney and shelf. Clutch size did not depend on type of nest nor on bottom area. Breeding success was not influenced by height of hole above ground, or bottom area but was by depth of the nest site. Success of broods was similar in all types of nest sites, and no differences were found between them. Also no differences were observed in breeding success in dead or live trees and in nests-sites with various entrance orientation. In conclusion, under natural condition, with high predation pressure, depth of hole seems to be most important factor determining safety broods of the Red-breasted Flycatcher.

WADERS' MIGRATION IN THE IBA VLADENI WETLAND (ROMANIA)

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The IBA "Jijia and Miletin ponds" (code 014) is situated at 40 km north west from Iasi city, around the confluence point of Miletin and Jijia Rivers, forming Vladeni wetland. The total surface includes 1730 ha aquatic surfaces and 280 ha canals and dams. The vegetation is variously reeds, dry and flooding meadows, agricultural lands and two forests (plantations of oaks, maples, hornbeams, beeches). During the migration periods – in spring and autumn – we can count in Vladeni wetland territory large flocks of waders (thousands exemplars), representing 28 species

During the spring migration, we recorded 25 species, some of them very rare in this part of Romania. *Pluvialis apricaria, Pluvialis squatarola, Gallinago media, Lymnocryptes minimus, Arenaria interpres* or *Limosa lapponica*. During whole migration period, there are two super dominant species *Vanellus vanellus* and *Limosa limosa*; in different stages of migration time, another two species becomes super-dominant, usually being dominant species – *Numenius arquata* and *Tringa totanus*. In the group of the dominant species appears constantly *Philomachus pugnax* and *Tringa erythropus*. In the October, in this group climbs another three species: *Calidris alpina, Calidris alba* and *Lymnocryptes minimus*. We notice the irregular presence autumn migration of *Gallinago media*. In December there are still 19 waders species present.

FORAGING HABITAT SELECTION OF GREAT CORMORANT ON SOUTHBOHEMIAN FISHPONDS (CZECH REPUBLIC)

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Foraging habitat selection of Great Cormorants (*Phalacrocorax carbo sinensis*) was investigated in condition of Southbohemian fishponds (Czech Republic, District of Jindrichuv Hradec). In 2000-04, the breeding population ranged between 117 and 162, whereas the total number of birds counted in the region culminated during spring and/or autumn migration, when 500-1000 birds were recorded annually.

This study is based on multi-factorial (esp. Canonical Correspondence Analysis) analysis of factors affecting numbers of occurring Cormorants on 447 fishponds (i.e. 2992.26 ha) regularly counted in study area during non- frozen period (from March to November) in 2002-04. The inter seasonal shift in pattern of distribution and total numbers as well as in habitat preferences was found in study area. During breeding season (late April – early July), cormorants occur in low numbers in many fishponds. On the other hand, their numbers increased remarkably during autumn and spring migrations when their occur on limited number of fishponds.

The distance of breeding colony was the most important factor affecting number of Great Cormorant during breeding and early post- breeding period. Among another factors affecting Great Cormorant numbers, availability of optimal fish stocks in fishponds, total area of particular studied fishpond, surrounding landscape structure and disturbance (shooting) pressure was recorded.

We assume that, several outputs of our analysis can be used are for understanding of factors affecting numbers of Great Cormorants on standing waters in Central Europe.

INTRA- AND INTERSEASONAL SITE FIDELITY IN REED BUNTING *Emberiza schoeniclus* IN LITTORAL STANDS OF FISHPONDS

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Factors affecting inter- and intra-seasonal fidelity of the Reed Bunting (*Emberiza schoeniclus*) were studied in littoral stands of fishponds near Kardasova Recice and Trebon town (South Bohemia, Czech Republic, 49.00-49.13 N, 14.44-15.52 E) and in 2000 – 2004.

In total, we caught 178 adult individuals during the breeding season from March to the beginning of July. The birds caught were marked by metal and colour rings, measured and weighed. Moreover, analysis of structure of occupied habitats was carried out.

These birds were caught in the beginning of the breeding season and later recaptured or recorded and identified by colour rings on nesting grounds.

We found higher inter seasonal and intra seasonal site fidelity in older males then in younger

males. No similar trend was found in females. Moreover, we did not find any effect of body condition on fidelity pattern.

Reed Bunting probably shows high male site fidelity and low philopatry due to young birds dispersion. Therefore, most young males in the second year of life do not breed in the site of their hatching. This dispersion can be suitable in condition of changing habitat of fragmented wetlands in the Central Europe.

EXPERIMENTAL INCREASE OF FLYING COSTS IN A PELAGIC SEABIRD: EFFECTS ON FORAGING STRATEGIES, NUTRITIONAL STATE AND CHICK CONDITION

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A central point in life history theory is that parental investment in current reproduction should be balanced by the costs in terms of residual reproductive value. In long-lived species, such as most seabirds, it is expected that individuals will not invest excessively in current reproduction because they would risk future reproductive attempts. To test this hypothesis, we studied the consequences of an experimental increase in flying cost on the foraging ecology and the body condition of adults as well as on the condition of their chick. Wing surface of 28 Cory's Shearwaters *Calonectris diomedea* from different nests was reduced by 5%, whereas other 14 pairs were used as controls. We monitored incubation bouts, some foraging trips by using light level geolocators (GLS), and took blood samples at laying, hatching and fledging to analyse the nutritional condition (plasma biochemistry and body mass), haematology, muscle damage and stable isotopes of N and C. Eighty days old chicks were measured, blood sampled and challenged with the PHA immune assay. During incubation, foraging effort was greater for treated than for control birds, as indicated by longer foraging periods, longer distance covered and larger foraging areas. However, oxygen demands, nutritional condition and stable isotope signatures did not differ between control and treated birds over the entire breeding period. In contrast, chicks from treated pairs were smaller and lighter and showed a lower immune response than those from control pairs. In conclusion, although treated birds had to increase their foraging effort, they maintained their physical condition by reducing parental investment and transferring the increased experimental costs to their partners and the chick. This result supports the fixed investment hypothesis and is consistent with life history theory predictions.

THE INFLUENCE OF NESTING HABITAT ON THE REPRODUCTIVE SUCCESS OF MARSH HARRIERS *Circus aeruginosus* IN THE PROTECTED LANDSCAPE AREA POODŘÍ: TIMING OF BREEDING

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Nesting habitat quality is one of the important determinants of population productivity in the Marsh Harriers (*Circus aeruginosus*). If parental pairs choose a high quality nesting habitat, they starts breeding earlier and increase probability to raise successfully more offspring. Parental pairs timed breeding when the surrounding vegetation was enough to decrease nest predation and to constitute a stable nest pillow. This study was carried out from 2002 to 2004 on 50 fishponds (6,8 km²) inside the extensive cultivated Protected landscape area Poodří. The breeding pairs of the Marsh Harrier concentrated in these fishponds, where large reedbeds dominated, especially Common Reed (*Phragmites* sp.) and Cattail (*Typha* sp.). I recorded a total of 44 attempts and 33 successful breeding cases. Egg laying started first in the Common Reed nesting habitat (in the second decade of April, with peak in the third decade), and only later in the Cattail habitat, with a significant delay of about 10 days between the two biotopes (two sample t-test, $n = 33$ nests, $p = 0.029$). The main reason was a difference between the two

habitats during incubation. We measured vegetation density and height around each nest, both were higher in the Common Reed than in the Cattail. The better nesting habitat positively influenced parental investment to offspring and this resulted in a higher breeding success than in the lower quality habitat (76% breeding success, n = 19 nests in Common Reed vs 41% breeding success in Cattail, n = 14, t-test, P = 0.05)

EFFECTS OF MACEDONIAN PINE *Pinus peuce* (GRISEB.) FOREST FRAGMENTATION ON BREEDING BIRD COMMUNITY STRUCTURE IN THE PIRIN NATIONAL PARK, BULGARIA

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In the last decades with growing of anthropogenic activity natural habitats become more and more fragmented. Effects of this fragmentation on wildlife are of prime concern for conservation ecology and especially referring to endemic habitats. During the breeding season of 2003 comparison of breeding bird diversity and community structure in fragmented and continuous Macedonian Pine forests was made on the territory of the Pirin National park, Bulgaria. A double visit point count method was applied. In total 33 bird species were found with some breeding evidence that represents a contribution of more than 50% of known bird list for the studied habitat. The bird diversity was highest in fragmented forests (N = 28, H = 2.83, e = 0.84) followed by the forest edge (N = 27, H = 2.78, e = 0.84) and lowest in forest interior (N = 25, H = 2.67, e = 0.83) of continuous forests. The difference found between the breeding bird community structures in studied habitat types is expressed mainly with different numbers of Chiffchaff *Phylloscopus collybita*, Goldcrest *Regulus regulus*, Nuthatch *Sitta europaea*, Willow Tit *Parus montanus*, Dunnock *Prunella modularis* and Black Redstart *Phoenicurus ochruros*. Tree Pipit *Anthus trivialis* and Wren *Troglodytes troglodytes* are more numerous in the edge than interior of continuous forests and fragmented forests. Obviously the Macedonian Pine forest fragmentation is favorable for Dunnock, Black Redstart and Chaffinch and disadvantageous for Willow Tit, Goldrest and Nuthatch

TERRITORIALITY AND SEASONAL DYNAMICS OF KINGFISHER POPULATION IN SERBIA

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Alcedo atthis is, among the 4 kingfisher species breeding in the Western Palearctic, having the widest distribution and the greatest abundance. This is a polytypic species, represented in Europe by two subspecies – *atthis* from the Mediterranean and southeastern Europe, and *ispida*, which occupies the range to the north and west from the nominal subspecies. According to certain authors, the Kingfishers from the southern part of Serbia belong to the Mediterranean subspecies *atthis*, while in the northern parts the dominant subspecies is *ispida*. During the ten years of activity of Center for Animal Marking in Belgrade (1993-03), 189 individual Kingfishers were ringed in 22 localities in Serbia, mostly during summer. In spite of the territorial behavior of the Kingfisher, particularly pronounced in the breeding season, none of the birds was recaptured at the ringing site, either in the same year or in the following years. Although the Kingfisher is present in Serbia throughout the year, the shifts from the breeding territory are present outside the breeding season. In order to gather more information on the degree of these movements, since 2004 ringing of Kingfishers was intensified in several localities in Central and North Serbia, with the first recaptures that will help the understanding of the seasonal movement of Kingfisher in the region. The marking method was also used in order to study the various aspects of territorial behavior of this species throughout the year.

THE COMPARATIVE STUDY OF VOCALIZATIONS OF THE WESTERN *Acrocephalus arundinaceus* AND EASTERN *A. orientalis* GREAT REED WARBLERS

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We studied vocalizations of *A. arundinaceus* (sea of Azov) and *A. orientalis* (Far East). The average length of *A. arundinaceus* songs is 3,3 ± 1,1 s, length of pauses between songs 4,3 ± 1,2 s. The length of *A. orientalis* songs is 5,5 ± 2,1 s, length of pauses 3,9 ± 2,5 s. The basic structural elements of both species songs are broadband notes (noise or harmonious), and also the tonal notes located in higher range of frequencies. An average frequency range of a notes at *A. orientalis* is 4,0±0,8 kHz, at *A. arundinaceus* - 2,5 ± 0,4 kHz. Average duration of broadbanded notes at A. *arundinaceus* is 0,11±0,04 s, at orientalis – 0,09 ± 0,03 s. Tonal signals at both species lay approximately in the same frequency range from 2,9 up to 7,6 kHz. Their distinction is, that at *A. orientalis* tonal signals are characterized by deeper and sharper frequency modulation. The average rate of repetition of identical notes in homotypic series in *A. orientalis* song is 4,8 ± 3,2 while in *A. arundinaceus* – 3,5 ± 1,3. For A. *arundinaceus* it is typical a pair packing of identical notes and their even number in homotypic series (84,9% of all series), for *A. orientalis* more variable organization of songs is characteristic (61,5% of homotypic series will consist of even number of notes). The study was supported by Russian Found of Basic Researches (04-04-49602, 04-04-49276, 04-04-63061).

HEALTH STATE AND PLUMAGE ORNAMENTATION IN THE GREY PARTRIDGE *Perdix perdix*

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In the Grey Partridge the rusty gate call and the vigilant behaviour of the males are important cues for the females to choose the best mate. A minor role was reported to be played by plumage ornamentation, particularly the horseshoe-shaped brown breast patch, a melanin dimorphic sexual character more developed in the male. However, since in many bird species multiple signals have been shown to be effective during male courtship, it is interesting to verify if plumage ornaments of the male Grey Partridge could reflect health conditions, as predicted by the "good genes" hypothesis.

In 64 breeding pairs, we measured nine variables of body plumage and three parameters of body condition (immune reaction to PHA, haematocrit, erythrosedimentation rate). The size of the brown breast patch of the males was significantly related to ES rate ($P < 0.01$, $r^2 = 32\%$) and PHA immune reaction ($P < 0.01$, $r^2 = 19\%$). No similar correlations were found for the females. Since the importance of melanin plumage patches for health state signaling have been put in evidence only recently, we stress their possible role as a cue in the Grey Partridge courtship behaviour and in sexual selection.

PASSERINES IN NW RUSSIA: EXPANSION TO NORTH

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In the last 50 years, essential shifts of the range boundaries of several European and Siberian *Passerines* have been occurring in N Europe. In contrast to the data from Scandinavia and Finland information from NW Russia has not been recorded in international reviews and atlases in proper time. The 2001-04 studies in Chernaya

Reka 66.31N 32.54E and surroundings (ringing, route counts, visual observation) showed continued northward expansion and increase of marginal populations (see also KOKHANOV 1969, 1987, BIANKI *et al.*, 1993, all in Russ). In this region settlements and other anthropogenic landscapes are the sites of high diversity of the *Passerine* fauna and the conductors of its southern elements to the north, while occupying no more than 2 3% of the area. In a village with the area of less than half a sq km 17 species of *Passerines* were regularly observed in the breeding season and 38 species were present here during post-breeding and migration seasons Several species, such as *Lanius collurio* (vagrants), *Garrulus glandarius* (vagrants, breeding probable), *Sylvia curruca*, *S. borin*, *Carpodacus erythrinus* (irregular or dispersed breeders), *Hirundo rustica*, *Delichon urbica* *Carduelis chloris* (regular breeders), *Emberiza pusilla* and *E. rustica* (abundant during the post breeding season), are closely tied to the developed landscapes. At the same time there is no evidence of the relation between the latter and the expansion of *T. troglodytes*, *Certhia familiaris* (vagrants, breeding probable), *Parus cristatus* (irregular breeder), *Erithacus rubecula* (regular breeder).

LONG-TERM CHANGES IN EUROPEAN POPULATIONS OF TRANS-SAHARAN MIGRANTS: ANALYSIS OF TRAPPING NUMBERS

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In recent decades it has become apparent that global climatic warming and in particular the droughts in Africa had a great impact on the breeding populations of long distance avian migrants. The analysis of bird trapping data from different European countries have shown contradictory results: some authors found a very uniform picture of the population dynamics with predominance of negative trends (BERTHOLD *et al.* 1999), whereas others had a very mixed picture in which similar trends alternate with discrepant ones (SOKOLOV *et al.* 2001). I have examined published data on the trapping numbers of long-distance migrants from ten European ornithological stations: Bokrijk, Helgoland, Reit, Mettnau, Illmitz, Ottenby, Mierzeja Wislana, Rybachy, Pape, and Kabli. From 142 long term trends of 18 bird species 34 per cent were negative, 11 per cent were positive, and the rest trends were insignificant. More negative trends than other trends were found in five species only: *Cuculus canorus*, *Jynx torquilla*, *Lanius collurio*, *Sylvia nisoria*, and *Muscicapa striata*. A significant negative correlation ($r_s = -0.672, p < 0.05$) between numbers of trapped birds and the proportion of negative trends were found: the higher the population numbers, the lesser probability of long-term decline. Presumably non-uniform distribution of migrants within the African continent can influence the species-specific population dynamics. There is abundant evidence that the declining population numbers of ten (at least) species are due to the effect of severe droughts in African winter quarters during recent decades

SPATIAL DISTRIBUTION OF BREEDING BIRDS AT FILDES PENINSULA AND ARDLEY ISLAND (SOUTH SHETLAND ISLANDS) IN RELATION TO HUMAN ACTIVITIES

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Bird breeding sites of penguins (*Pygoscelis spec*), skuas (*Catharacta maccormicki*, *C. antarctica lonnbergi*), Antarctic Terns (*Sterna vittata*), Kelp Gulls (*Larus dominicanus*), Southern Giant Petrels (*Macronectes giganteus*), Sheathbills (*Chionis alba*), Cape Petrels (*Daption capense*) and storm petrels (*Oceanites oceanicus*, *Fregetta tropica*) were mapped in the last years by using GPS/GIS. Of particular interest were changes in breeding pair numbers, breeding success and the distribution of selected bird species for the analysis

of human impacts The GPS/GIS data on bird breeding sites and the spatial and temporal extent of human activities were analysed. The results will be the basis for an environmental risk assessment in order to develop the management consequences (establishment of a new Antarctic Specially Managed Area). The western part of Ardley Island is one of the few places in the Maritime Antarctic where *Pygoscelis adeliae*, *P. antarctica* and *P. papua* breed sympatrically. The changes in population size of the three species are monitored by annual census. Therefore nests and chicks were counted from 1979 to 2005. To observe the spatial dynamic of the rookery the distribution of nesting groups is mapped regularly. Beginning with arial photographs in the 1980ies and hand drawn maps now GPS-mapping is the method. The poster will show some results derived from those long term monitoring data.

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REPRODUCTIVE STRATEGY OF BITTERN *Botaurus stellaris* IN EASTERN POLAND

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In 2003-04 studies on a population of the Bittern (*Botaurus stellaris*) breeding on the Lublin region fishponds were carried out in eastern Poland. The characteristic features of ecology of the species are the polygynous mating system and the long-range vocalization. Mean harem size of the territorial Bittern males in the study population was 1,7 ± 1,1 (range 0-4, N = 23). Due to the long winter of 2002/2003 and late arrival, the duration of the booming activity period in the first year was shorter and lasted 58 days (from 15 April to 11 June 2003) and in the second year was 92 days (from 19 March to 18 June 2004). Female settlement in male territories was positively correlated with vocalization rate The booming effort was the highest during the prelaying phase in the second half of April and dropped markedly after egg laying by females The incubation period started from mid-April to the end of May The mean complete clutch size was 4,5 ± 0,7 (range 3-6, N = 37 nests). The chicks hatched from mid-May to late June. The seasonal pattern of booming indicates mainly intersexual function of vocal activity among Bitterns

MONITORING WILDFOWL POPULATIONS THROUGH USE OF DATA COLLECTED BY WILDFOWLERS

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AVIFAUNA is a non-profit organisation aiming to promote links between the hunting, conservation and scientific communities in order to improve the knowledge and conservation of migrating game and their habitats Since 2002 it has established a monitoring program of wildfowl populations through data collected by wildfowlers in France.

Long-term objective of the program is to monitor population dynamics of migrating wildfowl species. The program involves collection of biometrical and biological data and will also allow getting a better knowledge of post nuptial migration phenology as well as providing an analysis of hunting bags in the country

The program is its infancy stage and data collected over the first three seasons will be presented and discussed. This will include an analysis of the origin of the data as well as a more detailed examination of data on the most commonly hunted migratory species: Eurasian Teal (*Anas crecca*) and Eurasian Wigeon (*Anas penelope*).

MORPHOLOGICAL VARIATION OF EUROPEAN REED WARBLERS *Acrocephalus scirpaceus* ACROSS A MIGRATORY DIVIDE

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A migratory divide is a zone of contact between two parapatric populations migrating to two disparate directions. Ringing recoveries of Reed Warblers (*Acrocephalus scirpaceus*) suggest that such a migratory divide exists in central Europe separating populations using SW and SE migratory directions when heading for their winter quarters in Africa. We studied morphological variation of Reed Warblers at 11 study sites stretching from Spain and Wales in the west to Lithuania in the north and Romania and Bulgaria in the east. Only data for adult breeding birds measured in 2003 and 2004 were included in our analyses. Body size (expressed as an index from PCA of three body measurements) increased with latitude and longitude. Even a stronger correlation of body size with both longitude and latitude was found for breeding populations with known SW migratory directions, whereas no such a trend was apparent for populations with SE migratory direction. Hungarian Reed Warblers differed from other populations by longer foot spans. The geographical patterns of Reed Warbler morphology will be discussed in light of the species' migratory divide and general ecogeographical gradients in birds (Bergmann's and Seebohm's rules).

LONG TERM STUDY OF BREEDING SUCCESS OF THE TREE SPARROW IN SOUTH-WESTERN SLOVAKIA

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Reproductive success is an important component of individual's fitness and its value depends on complex of abiotic and biotic factors. While these factors may change within different breeding season it is necessary to study this problem consecutively for several years.

Breeding success of the Tree Sparrow nesting in nestboxes was studied continuously in south-western Slovakia from 1995 till 2004. Study area was situated in National Nature Reserve Šúr near Bratislava in two sites (Alder fen wood and edge of termophilous Oak wood) one kilometer distant each other.

During studied period total breeding success varied from 49% in 2001 to 78% in 1998. Average number of fledglings per one breeding attempt was 3,1. Egg losses ranged from 11% in 1997 to 30% in 2001 and nestling mortality varied from 5% in 1996 to 28% in 2001. Within different broods the highest breeding success was found in first broods and the lowest in second ones. Generally, there was a decrease of breeding success toward to the end of breeding season.

Different factors caused variation in breeding success, hatching success and nestling mortality between studied years. Predation was one of the most important factors that caused differences in egg losses and nestling losses. Nestling mortality was influenced mainly by climatic condition in different years and pressure of ectoparasites. The greatest impact of ectoparasites was in 2001. (This study was supported by Scientific grant agency of Slovak republic, grants: VEGA 1/2369/05 and VEGA 1/0119/03)

IDENTIFICATION OF HYBRIDS BETWEEN TWO CLOSELY RELATED SKUA TAXA USING AFLP

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Hybrid zones offer opportunities to study evolution "in action". Hybridisation between phylogenetically young taxa is difficult to study because of problems in identifying hybrids based on morphology and sight only. To investigate hybridisation between South Polar Skua *(Catharacta maccormicki)* and Brown Skua *(Catharacta antarctica lonnbergi)* we developed a molecular reference for species assignment using AFLP (amplified fragment length polymorphism). 20 individuals per species from allopatric populations were used to establish primer combinations with diagnostic bands. 50 primer combinations were tested and 5 primer sets with 14 polymorphic loci were used to assign individuals to species and to identify hybrids. The method successfully assigned individuals to species and identified most of the hybrids. The loglikelihood space of hybrids overlapped with the loglikelihood space of South Polar Skuas and assigned individuals in this space had to be identified by sequencing cytochrom b (due to unidirectional hybridisation, thus hybrids carry always cytochrom b of Brown Skua). The knowledge about hybrid identity will be used for ecological studies in the future.

NUTHATCHES AND CATERPILLARS – CONSEQUENCES OF SYNCHRONIZATION

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The study was carried out in primeval lowland forest (Białowieża National Park, Poland). In 1998-04 data on breeding phenology, nestlings diet, nest losses, fledgeling production of about 250 Nuthatch pairs breeding in holes in two types of deciduous stands (Ash-alder and Oak-hornbeam) were gathered. Simultaneously, data about biomass of leaf-eating caterpillars (using frass collectors) living on four main tree species and weather conditions were collected. Nuthatches started to bred at different times in different seasons due to weather conditions in pre-breeding season, but in most cases nestling period were ideally synchronized with peak of caterpillar food supply. In such springs, caterpillars constitued the main component of nestling food (50%) and nest losses were very low (18-24%). A different picture was observed in seasons when the nestling period did not overlap with caterpillar supply. Share of caterpillars in nestlings diet as well as fledgings production strongly decreased. Nest losses increased up to 40% mostly due to predation. Explanations of such a relationship will be given.

WATERBIRDS MIGRATION ON THE AZOV-BLACK SEA COAST OF UKRAINE AND RISK OF WEST NILE VIRUS FOR HUMANS

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The biodiversity of Ukraine is characterized primarily by the influence of the East European Plain, which occupies 94% of the area of the country. The Danube River Basin, which runs along the Ukrainian-Romanian border before emptying into the Black Sea, has been recognized as a Global 2000 Ecoregion, based on selection criteria such as species richness, levels of endemism, taxonomic uniqueness, unusual evolutionary phenomena, and global rarity of major habitat types. In addition, Ukraine has 22 sites listed as wetlands of international importance under the RAMSAR Convention on Wetlands. There are more than 22,000 rivers in Ukraine with a total length of more than

170,000 km Almost all (96%) of rivers in Ukraine are part of the greater Black-Azov Sea watershed, the remainder flows to the Baltic Sea. Many rivers provide spawning grounds for globally endangered fish. Dams and reservoirs have changed the water regime of many rivers Most of the length of the Dnieper River within Ukraine, for example, is a cascade of six reservoirs, thus placing barriers to natural spawning routes, submerging a number of floodplains, destabilizing shores and slopes near the water line and destroying previously productive agricultural land (WARNER *et al.*, 2001)

The Azov Black Sea Basin covers almost the entire territory of Ukraine, including the basins of the Danube, Dnieper, Dniester, Southern Bug and several smaller rivers. The isolation of the seas from the open ocean has contributed to their rich diversity of flora and fauna The seas themselves are home to a number of unique zooplankton and phytoplankton A number of endemic species, including 32 aquatic invertebrates, live in the deltas, estuaries and Black Sea shelf along Ukraine's coastline These areas provide habitat or resting places for huge numbers of waterfowl, many of which are protected under international treaties

416 species of birds reside in Ukraine for at least some part of the year (FESENKO, BOKOTEI, 2002). Of these, 19 are listed on the IUCN red list and 67 in the Red Book of Ukraine. These include a number of important migratory birds. Over 100 of the 170 birds listed in the African Eurasian Migratory Water Bird Agreement either nest in Ukraine or stop during migration. As known, Azov-Black sea coastal area is very important migration ecological corridor for many species of birds from Europe, Asia and Africa (KORZUYKOV, RUSEV, GERJIK, 1998).

IS MATING A RANDOM PROCESS IN REPRODUCTIVE WHITE STORK *Ciconia ciconia* POPULATION?

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Mating in long-lived birds is generally age and/or experience assortative i e individuals of similar age and/or experience are more likely to become paired. Mate preference based on age or experience is usually explained by a non-random mate selection because older and experienced birds tend to have higher reproductive success. We tested this hypothesis using a long-lived species, the White Stork as biological model, our main aim was to investigate if active choice is implied in the age- and experience-assortative mating process by comparing the observed distribution of age and experience with a theoretical distribution

SUMMER-AUTUMN MIGRATION AND ORIENTATION OF THE YELLOW WAGTAIL *Motacilla flava* (L.) IN THE WESTERN UKRAINE

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The main directions of the orientation of Yellow Wagtail during the summer autumn migration in the western Ukraine are described in the present note. Western Ukraine is a territory, which is interesting and rather poorly studied in the respects of what subspecies of the Yellow Wagtail migrate through its territory and are Baltic populations flying here The birdwatching, ringing and study of the migration directions were conducted stationary, on the territory of Cholginski ornithological reserve (50 km west from Lviv, 49 58N 23 28E) during the

period of ten years (1995-04 pp.) with using special cages following the method of BUSSE (1995). A total 10313 specimens of the Yellow Wagtail were catched and ringed, wile 63 orientation tests were performed, among them in 58 the selection of direction differs considerably from the accidental. Raw data was analyzed with using computer software *Orient 4.0, Statistica and Quatro Pro 8.0 for Windows*. The obtained results confirm two preferred directions on the autumn migration of the Yellow Wagtail. SE direction is more characteristic for adult birds, while SW direction – for young specimens. The *M. flava thunbergi* specimens were captured among numerous birds of the *M. flava flava*.

FUNCTION OF HOST-ABSENT BEGGING IN THE COMMON CUCKOO *Cuculus canorus* CHICKS

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Begging of Common Cuckoos *Cuculus canorus* in the absence of hosts may provide interesting insights into the host-parasite coevolution. We hypothesise that the nestling of the brood parasite may use host-absent begging (HAB) as an additional signal to increase the delivery rate of food by their foster parents. We tested whether HAB played back to foster parents, Reed Warblers *Acrocephalus scirpaceus*, increases their provisioning rate to young cuckoo. Each cuckoo chick was assigned to one of two age categories and to one of two own HAB levels. Provisioning rate did not differ between the control and the experiment, in either of the two age categories. Similarly, we found no increase in provisioning rate, in either of the two own HAB levels. When we pooled all experiments, the GRM model examining the increase in provisioning rate showed significant effect of own HAB level, while the effect of age was not significant. The provisioning increase was higher in chicks with low own HAB level than in those with high own HAB level. It seems that in chicks that previously "exhausted the possibility" of using their own HAB, the provisioning cannot be so much enhanced by playback as in chicks with low level of own HAB. Our results support the idea that HAB may be an optional signal to increase the provisioning rate. However, HAB in young cuckoos may also have other functions, such as establishing a vocal bond with the hosts which is used after fledging.

APPEARANCE OF THE INVASIVE YELLOW-LEGGED GULLS *Larus cachinnans* LEADS TO MALADAPTIVE BEHAVIOURAL RESPONSE IN NATIVE BALCK-HEADED GULLS *Larus ridibundus*

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We studied mechanisms of interspecific competition between invasive Yellow legged Gulls (YLG) and native Black-headed Gulls (BHG) in southern Poland. We found that YLG excluded BHG from breeding ground over the years. BHG bred in taller and denser vegetation in the presence of YLG. Nest of BHG in the presence of YLG were also better guarded than on control area. Despite this, breeding performance of BHG was much worse in the presence of YLG. Especially egg loses and nest abandonment were very frequent in the presence of YLG. However, these failures were caused by BHG themselves. BHG were involved in many conflicts with YLG, which resulted also in much higher rate of intrasecpecific conflicts with neighbouring BHG, comparing to control area.

SPATIAL AND TYPOLOGICAL STRUCTURE OF THE ORNITOCOMPLEXES FOREST STEPPE OF THE SOUTH-WEST SIBERIA

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The distribution of birds in Southwestern Siberia was previously analysed by JOHANSEN H (1943-1961). The birds were counted on about 2240 km on not strictly fixed routes without restriction of transect width (RAVKIN, 1967). In total 62 habitats were studied from May, 16 till August, 31 1984 and 1986 87. The classification of population was carried out with the help of one of the methods of factorial classification-qualitative analogue of the method of principle components (TROFIMOV, RAVKIN, 1980).

Spatial and typological classification of the population of birds in the first half of summer (16.05-15.07) on the level of a subtype is presented as three condensations of communities connected among themselves: vacant land; rivers and lakes, cities and settlements. The basic tendencies of territorial changes in the first half of summer are defined by forests, much moisture and water, and also presence of reservoirs, settings and ruderality. The subtypes of the population presented in the scheme in the second half of summer, are more ordered, than in the first, in connection with level ing of influence of after nesting migration of birds. According to the classification of the population for the summer period for individual estimation of communication the six factors of environment were selected, basically determining the territorial variability of ornitocomplexes. The most significant was the anthropogenous influence, including the settlements and land cultivation.

COMPARISON OF BIOMETRIC DATA AND MIGRATION PATTERNS OF *Sylvia* SPECIES IN WESTERN SIBERIA AND SOUTH-WESTERN GERMANY DURING AUTUMN MIGRATION

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In a comparison of passing Lesser Whitethroats (*Sylvia curruca*), Garden Warblers (*Sylvia borin*) and Whitethroats (*Sylvia communis*) at two sites in the western and central palaearctic we studied wing length, body mass, and fat deposition during autumn stopover. Whereas migrants at "Mettnau" (Radolfzell, Southwestern Germany) cover distances between 5000 and 6,000km, the migration distances of the birds passing the "Omsk" (Western Siberia, Russia) region are assumed to be between 6000 and more than 7,000 km. We compared birds trapped in the autumn seasons 2000 and 2001 at both sites. In "Omsk" the mean body mass of Lesser Whitethroats was 12.2 g (9.0-18.5 g. n = 74, Std. Error of mean 0.217) and at "Mettnau" 12.0 g (10.1-15.4 n = 99, Std. E. of m. 0.101). Fat is 2 and 2 balls on average. Mean winglength of birds in "Omsk" was 65.5 mm (59.0-76.0 mm, n = 74, Std. E. of m. 0.279) and of those at "Mettnau" 66.0 mm (62.0-72.0; n = 94, Std. E. of m. 0.166). For the Garden Warblers in "Omsk" and at "Mettnau" had a mean body mass of 20.4 g (15.1-30.9; n = 80, Std. E. of m. 0.316) and 19.0 g (14.3-27.5 n = 606, Std. E. of m. 0.076). Fat is 3 and 2 balls in average. Wing length was 77.2 mm (62.0-88.0 mm; n = 73, Std. E. of m. 1.009) and 77,7 mm (61.0-83.5; n = 568, Std. E. of m. 0.088). The results for the Whitethroats were 16.6 g (12.6-23.4; n = 25, Std. E. of m. 0.579, "Omsk") and 15.0 g (12.9-19.4; n = 32, Std. E. of m. 0.251, "Mettnau") for body size and 74.3 (70.0-80.0, n = 29, Std. E. of m. 0.559) and 73.3 (68.0-77.0; n = 32 Std. E. of m. 0.359) for wing length. Fat is 3 and 3 balls in average. As expected the Siberian birds with the longer flyway have on average a higher body mass and longer wings. All values for "Mettnau" station are well within the known limits for central European populations whereas data from the Omsk region collected on autumn stopover are published for the first time here.

THE BREEDING ECOLOGY OF THE SPOTTED FLYCATCHER *Muscicapa striata* IN THE UK

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Spotted Flycatchers are a species of high conservation concern in the UK, with an 85% population decline from 1967-2002. They are a 'habitat-edge' species, characteristic of the transition between wooded and open habitats. As such they occur in both farmland and woodland landscapes, but have shown similar population declines in both habitats

As a 'farmland' bird, they are one of very few species for which we have little information on species ecology and causes of population decline. As a 'woodland' species, they are also of increasing conservation interest and concern. This study concentrates on factors potentially affecting Spotted Flycatchers on their UK breeding grounds specifically those relating to the availability of suitable invertebrate prey. Key hypotheses are that changes to habitat structure and management in the UK over recent decades have resulted in a reduction in the abundance and/or accessibility of insect food The hypothesised mechanisms of population decline are therefore reduced annual productivity and/or reduced survival of birds through poor body condition The study will examine whether presence or absence of Spotted Flycatchers can be explained by variation in habitat structure or insect abundance, both of which may affect food availability. Detailed autecological work, including nest monitoring and dietary analysis will determine whether productivity and/or chick condition are influenced by habitat or food abundance variables The results of this project will have implications for the conservation management of both farmland and woodland.

NEST SITE SELECTION IN REED BUNTING *Emberiza schœniclus* IN A FARMLAND OF WESTERN POLAND

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Reed Bunting nest distribution in relation to microhabitat variables has been analysed in 2003-2004. Birds bred in midfield marsh patches of a different area and on verges of drainage ditches. In total 36 nest were found. Eight vegetation variables were measured within 50 x 50 cm plots containing nest: dry reed shoots number and maximum height, new reed shoots and their maximum height, dry grass coverage and height, fresh grass coverage, number herbs stems. Analogous measurements were taken in random plots located within two metres of the nest site In comparison to random plots, Reed Buntings nest sites contained significantly more and higher dry grass, higher dry reeds and less fresh grass There were no significant differences in microhabitat structure between nest located in "optimal habitats" (marshes of the area > 1 ha) and "marginal habitats" (ditches and marshes of the area < 1 ha). The of thick layer of dry grass might provide better cover above the nest and protection against avian predators. On the other hand, in plots with high ratio of dry grass nest were placed significantly higher ($r_s = 0.73$ $p < 0.01$), thus less prone to detection by mammalian predators (e g. *Mustelidae*).

THE WEST-POMERANIAN POPULATION OF THE AQUATIC WARBLER *Acrocephalus paludicola*: HABITAT CHANGE AND RESTORATION POTENTIAL

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The Aquatic Warbler (*Acrocephalus paludicola*) is a globally threatened species. Around 1900, it was one of the most widespread birds in Central-European fen mires The population severely decreased as a consequence of wetland drainage. In recent years, it is stable in the Polesie region (Eastern Poland, Belarus, Ukraine) where about 80% of the world population is concentrated, but decreases sharply in Western Pomerania. Distinct genetic differences to all other populations suggest that the remaining birds in Western Pomerania are the last survivors of a separated, large Central European population. Its conservation has high priority (reflected in a CMS Memorandum of Understanding in 2003), but it is hampered by insufficient knowledge on habitat requirements.

First results of a PhD study on Aquatic Warbler habitat requirements and habitat restoration potential in Western Pomerania are presented Field data on vegetation structure, soil and nutrient conditions, food base, land use, and landscape structure were collected throughout the breeding seasons 2004 and 2005 in most sites currently used by the species in Western Pomerania and in sites recently abandoned. Multivariate analysis of field data indicates that litter properties, water level, and landscape structure are key factors of habitat selection. The relative impact of key factors is quantified using field data from 2005. Management recommendations for suitable land use techniques are given. They are to be tested in a Polish-German EU-LIFE project targeting Aquatic Warbler conservation in Western Pomerania 2005-2010

MIGRATION OF RUSTIC BUNTING *Emberiza rustica* AT THE EASTERN EDGE OF ASIA

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Migration routes/periods of Rustic Buntings (*Emberiza rustica*) from various parts of habitat are still unknown. In 1998-2004 in south-east of Primorye (Russian Far East) 1029 buntings were banded in spring and 12033 in autumn with no distant returns obtained, except for one recapture near the shores of Primorye from a few thousand birds banded in Toyama (Honshu, Japan) suggesting a direct migration across Sea of Japan

Confirmed facts: 1) Spring transitory migration in south Primorye takes a short time till late April, but in Toyama it is still an abundant migrant. 2) In autumn at the mainland side of the Sea of Japan, birds are numerous from mid September till early November. Migrants differ in phenotype. Larger/brighter birds of probably Kamchatka subspecies – *latifascia* fly last. Linear trends of wing length and weight rise toward November. 3) Kamchatka ones, October 2004, were often seen resting on vessels in Sea of Okhotsk, dead birds gathered 4) Birds on Sakhalin are scarce in migration periods (autumn catches in 2000-01 showed 3, 78% of other bunting species)

Hypothesis: Probability of 2 flyways of Kamchatka population: to south east Asia (main one) across edge of mainland and across Sea of Okhotsk (birds from southward parts of the mainland also take this route) A small part deflects from the main way to cross Sea of Japan Birds of Kamchatka east migrate, probably, along its shores via Commodore, Kurile Islands past Sakhalin to Japan. A guess needs confirmation maybe by molecular methods while studies of distant migrations by number of returns at transasian flyway provide no results

NEST SITE SELECTION IN HOOPOE LARKS: A TRADE-OFF BETWEEN MICRO-CLIMATE AND PREDATION RISK?

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The aim of our study was to gain insight in the roles of predation risk and thermal environment in nest-site selection by Hoopoe Larks (*Alaemon alaudipes*) in the Arabian Desert. Hoopoe larks build nests in different microsites: under vegetation, on top of bushes, or on the gravel plain away from vegetation. We measured predation rate and microclimate for these three nest types and observed the behavior of incubating parents.

In the course of the season the number of nests under and away from vegetation decreased, while the number of nests on top of bushes increased. In addition to nest height, nest cover also increased during the season. Nest predation risk was high with a daily survival rate of 0.86 for all nests. It did not differ between nest sites or over time. Operative temperature (Te) during midday was 5 °C higher in exposed nests than in nests under or on top of vegetation. In the course of the season differences in Te between nest sites decreased. Egg temperatures for unguarded eggs exceeded the supposed lethal temperature of 44 °C for longer time periods in gravel plain nests than in nests under or on top of vegetation. We conclude that nest site preference of Hoopoe larks changes in the course of the season, from nests on the ground with little or no cover to nests on top of bushes with slightly more cover, but still remarkably exposed. We hypothesize that Hoopoe Larks favor exposed nest sites to reduce predation risk for the incubating parents, and only reluctantly select more cover in the course of the season when the thermal environment forces them to do so.

IMPROVEMENT OF MALLARD *Anas platyrhynchos* NESTING SUCCESS BY ELEVATED ARTIFICIAL NEST SITES WITH PREDATOR GUARDS

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Number of breeding Mallard *Anas platyrhynchos* tends to decline almost everywhere in Latvia due to heavy predation both by native and alien predators. Nesting success of Mallard on ponds and some lakes recently was only about 25%. To improve nesting success, since 1999 different kinds of elevated artificial nest sites supplied with predator guards were examined in Latvia. Mostly two-entrance nest sites (hay-cylinders, wooden boxes) were used. About 900 nest site controls in 1999 – 2004 allow the following conclusions:

- nest sites on ponds were better occupied than those on big lakes rich in natural nesting surfaces,
- in ponds with average nest site density 1.7 per ha 47% of them were occupied by Mallard,
- top achievements were pond E: 10 ha – 55 nest sites – 35 (64%) occupied, pond T: 10 ha – 23 nest sites – 22 (96%) occupied,
- up till 2004 no predation neither by American Mink *Mustela vison* nor Marsh Harrier *Circus aeruginosus*, Hooded Crow *Corvus corone cornix* and Raven *Corvus corax* was observed in correctly mounted nest sites supplied with predator guard,
- single cases of successful mink predation in artificial nest sites were observed when predator guard was lacking, incorrectly made or hard-stem emergent plants close to nest site facilitated climbing,
- elevated artificial nest sites with predator guards should be considered as a promising way to improve nesting success of Mallard.

BIRD ASSEMBLAGES IN AN EXTENSIVE AGRICULTURAL AREA OUTSIDE THE BREEDING SEASON

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Between October 1997 and February 1998 we studied the bird assemblage of the agricultural area in Lower Savinja Valley (Central Slovenia). The study plot measured 67 ha and was located in the prealpine area. Investigations were carried out using the line transect. 15 visits were carried out and a total of 50 bird species were registered. This is a relatively high number of species when compared to studies from other agricultural landscapes in Central Europe. Only *Passer montanus* and *Fringilla coelebs* were dominant species during all months. During the study period the number of species decreased significantly ($r_S = -0.65$, $P < 0.01$, $n = 15$). Nevertheless there was no relationship between total bird density and month. In contrast with a previous study, we found a positive significant relationship between density of *Fringilla coelebs* and month ($r_S = 0.45$, $P < 0.05$, $n = 15$). Reasons for high number of species and stable density throughout the study were probably good availability of food, meteorological conditions (mild winter with little snow), geographical position of the study area, the high density of hedgerows in the study area and the surrounding habitats.

PAN-EUROPEAN COMMON BIRD MONITORING: TOWARDS DELIVERING POLICY RELEVANT INDICATORS OF BIODIVERSITY IN EUROPE

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Pan-European Common Bird Monitoring Project has commenced in 2002. The main goal of the project is to use common birds as indicators of the general state of nature using data on changes in breeding populations across Europe. Data from 18 European national breeding monitoring schemes have been collected in 2003 and 2004. Standardised procedure using log linear models has been used to produce Pan European indices and trends for 48 species in 2003; number of species was extended almost twice in 2004. Indices have been produced for each species and country, for regions and for the whole Europe. Estimated size of breeding population in each country has been used as a weighting factor to estimate Pan-European indices. Combined index (indicator) has been produced for groups of species characteristic of a habitat type (e.g. farmland, forests). Deep decline of farmland bird indicator in Europe since 1980, particularly in old EU countries, has shown a negative impact of agriculture intensification on population of birds. The farmland common bird indicator, the first biodiversity indicator based on wildlife data, has been already accepted to the Long list of EU Structural Indicators and to the list of EU Sustainable Development Indicators as a biodiversity indicator. The project is still in a stage of development and it is planned to improve the scheme, to produce the indicator for forest common birds and to produce indices and indicators annually. Indices and indicators will be presented together with comments on methodology and their policy relevance.

OBSERVER EFFECT ON NEST PREDATION OF OPEN NESTING PASSERINES

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The disturbance associated with nest monitoring raises concern about validity of the estimated nest success and well-being of the populations under study. It has been hypothesized that observer activity may attract/deter predators to/from bird nests, thus decreasing/increasing nest success. Most previous studies related nest suc-

cess to frequency of nest visits or estimated nest survival rate over rechecking intervals of different length. While such studies can detect an overall observer effect, they usually cannot reveal the underlying mechanism through which predation rate is influenced, because the timing of predation events remains unknown I measured the exact survival times of 732 nest of 11 *Passerine* species using data loggers and analyzed them by methods of survival time analysis. My objective was to examine the relationship between predation risk and the time passed since observer visit. The work took place in the Czech Republic, in 2001-2003 Deployment of data loggers did not negatively influence nest survival.. I found a short-term positive observer effect that lowered predation during 2-6 hours after the nest visit, but did not detectably affect the overall nest success. This effect was more pronounced in small (warbler) than in large (thrush) species and during the egg than during the nestling stage. No effect was detectable on a conventional daily basis. The short duration of the effect implies that potential predators were deterred from the nests directly by the presence of the observer rather than by tracks of its activity

CROSSING A BARRIER: SEASONAL VARIATION IN THE NOCTURNAL FLIGHT BEHAVIOUR OF MIGRATORY BIRDS IN THE WESTERN BALTIC SEA

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The Baltic Sea is a remarkable barrier for Scandinavian landbirds that has to be crossed during migration. The behaviour of birds flying seaward (in spring) or landward (in autumn) was investigated in the western Baltic by using vertically operated surveillance radars The mean traffic rate, flight altitudes, and flight directions of nocturnal migrants were determined at a coastal site in Germany (Darßer Ort). In addition simultaneous measurements were undertaken on a research vessel 13 km offshore during several nights in both seasons. Migration was more intense in spring than in autumn reflecting an obvious bundling effect of the Darß-Peninsula during spring migration. Migration intensity peaked within the first two hours after sunset in spring and progressively decreased afterwards A second small but obvious peak at about sunrise reflects reverse migration during morning hours Reverse migration was not observed in autumn. Migration intensity peaked significantly later after sunset in autumn than in spring according to the temporal course of crossing the sea. In spring, flight altitude was very similar over land and over sea whereas in autumn an expressed drop in flight altitude at landside was observed. The data suggest that after crossing the Baltic Sea in autumn a large proportion of birds start to land immediately after recognizing land structures beneath.

BEHAVIOUR OF THE MARSH HARRIER DURING THE POST-FLEDGING PERIOD

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Thirteen individually marked Marsh Harriers (5 adults and 8 fledglings) from three families were observed on the calcareous marshes near Chelm in eastern Poland. Young harriers start flying at 37 42 days after hatching. Young males started to fly earlier then females. Duration of the post-fledging period (PFP) was 25 to 37 days, on average 32 days Daily numbers of fledging flights increased up to the third week and then decreased Total time of flight increased up to the fourth week of the dependent period. The number of the flights in last week before departure from breeding places was significantly less than in the former weeks The maximum time of the single flights increased from the beginning up to fourth week The maximum time of the flight observed in a young bird was over 32 min. Progress in the flight technique from fast flapping through simply gliding and soaring up to using of thermal air currents was

observed. Most food was delivered by males (68%) but female prey were bigger Until the second week females spent most time near the nest. In the second week females started to hunt intensively from the 10-th day of PFP. Two peaks of feeding were observed· first before noon (near 10 00 a.m.), second after noon (15-17 00 p m). Dominant component of the food were small mammals (95%) Number of prey delivered by adults increased up to third week. To the end of parental care the rate of delivering prey was 3 4 items per young daily. First successful aerial food transfers between young and adult bird were observed in 9-th day of PFP. A few cases of kleptoparasitism between young and adults from neighbourhood were observed. From the beginning of third week parental investment (time spent near the nest, flights to fledgings, aggressive behaviour to intruders) decreased. Aggressive behaviour, daily area of activity and distance between fledgings increased to the end of the post-fledging period

DIFFERENT FACTORS AFFECTED BETWEEN-SEASON DIVORCE RATE IN URBAN POPULATION OF EUROPEAN BLACKBIRD *Turdus merula* IN CENTRAL AND WESTERN EUROPE

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The within-season divorce rate of the European Blackbird was studied in 1997-2003 in two city parks in Szczecin (NW Poland). Within the population studied, 52 and 51% of pairs in each park were observed to divorce. Of the eight parameters included in the analysis, the divorce rate was found to depend on marriage training and time of territory acquisition. Among the pairs with marriage training, 19 5% were observed to divorce, the divorce rate among those pairs without marriage training being 65 5% Those birds which acquired their territories earlier divorced their partners significantly less frequently than those that acquired the territory at a later date. Regardless of their age, the divorced birds showed a reduced number of fledglings raised with a new partner. The reduced breeding success may be a result of a poor adaptation to the increased predator pressure Similar divorce rate in the pairs with and without breeding success and the rarer and rarer divorces among pairs that claim their territories earlier strongly support the 'musical chairs' hypothesis, but the more frequent desertion of poor territories by females as well as the differences found between old males and females in the timing of the onset of breeding before and after divorce indicate that divorce is an individual's strategy aimed at finding a way to maximise its own fitness

ASSESSMENT OF FORAGING TRIPS OF *Calonectris diomedea borealis* FROM SELVAGEM GRANDE (NE ATLANTIC) DURING INCUBATION, BY SATELLITE TRACKING

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Breeding Cory's Shearwaters *(Calonectris diomedea borealis)* of Selvagem Grande undertake foraging trips during incubation which may last from 5 to 23 days Although the population of this species on Selvagem Grande has been studied over a period of more than 30 years, with more than 30,000 birds ringed, information on foraging trips was impossible to obtain accurately until the advent of satellite tracking technology. Although satellite tracking of large-sized birds (Albatrosses, Storks, etc.) has been carried out successfully, Platform Transmitter Terminals (PTTs) have only recently been miniaturized to the point where they can be used on birds such as Cory's Shearwaters (maxi-

mum 5% of body weight). A previous attempt to apply this technology to the present species was not completely successful, mainly due to the method of attachment leading to premature loss of the transmitter. In the present study, a new method of attachment of the transmitter was successfully tested allowing not only the tracking of 5 birds during foraging trips, but also the recovery of all the PTTs. These birds travelled SE, from Selvagem Grande towards Africa, where they stayed feeding along the continental shelf of Morocco and Western Sahara. Based on the results obtained, there is no evidence the birds actively feed either around the Selvagens, or on the outward or incoming trips. Although Cory's Shearwaters do not face an immediate threat on the Selvagens, it is important to know where these birds spend their time at sea, in order to assess any possible threats due to marine pollution or predation and also to identify important areas of high biological production in the ocean. Ultimately, Cory's could be used as bio-indicators of the state of the ocean and key-species for the establishment of the long needed Marine Protected Areas, essential to the future of the ocean resources

NICHE SEGREGATION, BEHAVIOURAL DIFFERENCES, AND RELATION TO MORPHOLOGY IN TWO IRANIAN SYNTOPIC WHEATEARS: *Œnanthe lugens persica* AND *Œnanthe œnanthe libanotica*

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Mechanisms of niche segregation were studied between two uncommon syntopic species of wheatears, Mourning Wheatear *Œnanthe lugens persica* and Northern *O. oenanthe libanotica* in their breeding areas in Iran. The aim of this study is to find out to which extend morphological differences can determine and segregate the ecological behaviors of these two species at extreme points of their breeding distribution toward semi desert areas

The behavior foraging techniques, movement patterns as well as habitat variables (vegetation, mineral substrates, and topographical features) were studied along their contact zone in two protected area in Zagros Mountains chains. Morphological variables were studied on museum skins. Although these two species didn't show any differences in bill characters, striking correlation were found between flight and foot-leg complex apparatuses and foraging modes, as well as movement patterns However, our study shows a low correlation between morphological traits and micro habitat selection, we found significant differences in type and height of perching posts between two species Overall our results suggest that two co-existence species might segregate their micro habitat by different behavioural modes specially foraging behaviours. This result is in agreement with this possible assumption that morphological traits are correlated with ecological behaviors which might correspond to reducing interspecific competition.

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INSTALLATION DE LA PERRUCHE À COLLIER *Psittacula krameri* (*Aves, Psittacidae*) DANS L'ALGEROIS ET PREMIÈRES DONNÉES SUR SON ÉCOLOGIE TROPHIQUE DANS CETTE RÉGION

Djamel BENDJOUDI[1], Jean-François VOISIN[2], Salaheddine DOUMANDJI[3] & Belkacem BAZIZ[3]

Colonisation of the Algiers region by Ring-necked Parakeet *Psittacula krameri* (*Aves, Psittacidae*) and first data of its feeding ecology in the region. Between 1988 and 1990, six to eight Ring necked Parakeets escaped from the Hamma Trial Garden aviary (Algiers, Algeria) and started breeding locally, giving raise to a population of approximately 200 individuals in 2004 These birds are now seen in small groups, in the town of Algiers, the Algiers Sahel and the Mitidja lowland Observations on the feeding behaviour of *Psittacula krameri* show that it eats fruits, seeds, and flowers of 40 plant species, about half of which are aliens. These exotic plants were introduced in the Trial Garden from 1860 to 1962 Many of them were then multiplied and dispersed in forests and family gardens in the region of Algiers. At present, Ring-necked Parakeet only cause marginal damage to fruit crops in the Algiers region, but things could change in case of a marked increase in their numbers

Mots clés : Perruche à collier, Alger, Mitidja, Régime alimentaire

Key words: Ring-necked Parakeet, Algiers, Mitidja, Diet

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INTRODUCTION

Selon les résultats d'une enquête chez le personnel et les riverains du Jardin d'Essai du Hamma (Alger), six à huit Perruches à collier *Psittacula krameri* adultes se seraient échappées vers 1988-1990 d'une volière accidentellement ouverte Ces Perruches à collier se sont maintenues à l'état sauvage dans le Jardin d'Essai et ses environs, et en 1996 l'espèce était nidificatrice en ce lieu. Il existe aujourd'hui (2004) dans la région d'Alger une population que nous estimons à environ 200 Perruches à collier. Nous n'avons pas pu savoir exactement à quelle(s) sous-espèce(s) appartenaient les oiseaux échappés. Il est vraisemblable que certains, voire la majorité, aient appartenu à la forme nominale *P. k. krameri* (Scopoli), qui occupe la ceinture sahélienne depuis la Sénégambie jusqu'au sud du Soudan, et est de ce fait largement représentée chez les marchands d'oiseaux en Algérie, ou encore à la sous-espèce *parvirostris* (Souancé), que l'on trouve du Soudan à la Mer Rouge. Il est également possible qu'il y eût parmi eux des individus d'une des deux sous-espèces asiatiques *P. k. manillensis* (Bechtein), d'Extrême-Orient, ou *P. k. borealis* (Neumann), répandues depuis Bagdad, en Irak, jusqu'en Thaïlande, ou encore des hybrides entre formes africaines et asiatiques En effet, nous avons observé plusieurs fois des individus présentant le bec entièrement rouge,



Fig. 1 La région d'étude ★ = Stations d'observation — : limites entre les régions naturelles
Study area ★ = *observation points*, = *boundaries between natural regions*

caractéristique de ces dernières. Quoi qu'il en soit, la Perruche à collier fait maintenant partie de l'avifaune algérienne, et il était souhaitable de se pencher sur son alimentation pour essayer de déterminer certaines des raisons qui ont permis son maintien et sa multiplication. C'est le but recherché à travers le présent travail.

La Perruche à collier n'a pas seulement été observée à l'état sauvage dans la région d'Alger. En 2004, elle a été notée dans les gorges de la Chiffa, près de Médéa (5 individus, juin), dans la vallée de l'oued Sébaou, près de Tizi-Ouzou (2 individus, avril), et à Biskra, dans le Sud (1 individu, avril), mais nous ne sommes pas autrement renseignés sur ces populations

RÉGION D'ÉTUDE

La région d'étude comprend trois parties de superficie inégale, le Jardin d'Essai du Hamma d'Alger, le Sahel algérois et la plaine de la Mitidja. Le Jardin d'Essai se situe au fond de la baie d'Alger et appartient à l'étage bioclimatique subhumide à hiver chaud Il s'étend sur 30 ha entrecoupés par des allées bordées d'arbres (Carra & Gueit, 1952), et possède quatre bassins et une végétation très diversifiée, avec de nombreuses plantes d'origine tropicale. La stratification végétale varie de 2 à 4 selon les parcelles. Le Sahel algérois est assez hétérogène, vallonné et fortement urbanisé Il occupe environ 65000 ha. On y trouve des falaises naturelles ou artificielles, en tuf facile à creuser pour les oiseaux cavicoles. Quelques enclaves de maquis à *Olea europaea oleaster*, *Pistacia lentiscus* L., *Phillyrea angustifolia* L., *Rhamnus alaternus* L. et *Smilax aspera* L. alternent avec des vergers d'agrumes et de Néflier du Japon, des cultures maraîchères et des arbres d'ornement comme des figuiers, des Mûriers blancs et noirs, divers palmiers ou du Lilas de Perse, dont beaucoup en alignements le long des routes et des chemins. Des bosquets d'eucalyptus, de Pins d'Alep et de Pins parasols dominent le paysage. La Mitidja s'étale en forme de croissant sur près de 150000 ha en contrebas du Sahel, et rejoint le littoral oriental vers Bordj El Kiffan et Aïn Taya. Dans le quadrilatère formé par Larbâa, Birtouta, Oued El Alleug et Soumâa cette plaine est occupée par de vastes vergers d'agrumes. Cependant, autour de Boufarik, de Blida et de Rouiba on trouve des plantations de néfliers et d'autres Rosacées tels que des pommiers, des poiriers, des pêchers, des abricotiers, des pruniers et des amandiers, souvent séparés par des parcelles de céréales et de cultures maraîchères (Doumandji, 1981)

METHODES D'ETUDE

Pendant neuf années consécutives, de 1996 à 2004, 17 observateurs ont prospecté régulièrement 11 sites fixes et y ont consigné tous leurs contacts visuels et auditifs avec la Perruche à collier (FIG 1). De plus, cet oiseau étant bien visible et identifiable, ils ont réalisé une enquête permanente sur ses déplacements auprès de la population locale. Notre inventaire est certainement encore incomplet, mais nous pensons qu'il donnera néanmoins une bonne idée de l'alimentation de la Perruche à collier dans l'Algérois Sur le littoral d'Alger, les stations d'observation étaient implantées à Staouéli à l'Ouest, au Jardin d'Essai et au Lido (Bordj El Kiflan) au centre et au marais de Réghaia à l'Est. Trois autres se trouvaient à l'intérieur dans le Sahel, à Ben Aknoun, Tixeraine et Hassen Badi, et les dernières dans la plaine de la Mitidja à Beaulieu, Oued Smar, El Djemhourya et à Dar el-Beida.

RÉSULTATS ET DISCUSSION

Comme ailleurs dans le monde (COLLAR, 1997; MOULAI (Thèse INA); JUNIPER & PARR, 1998), dans la région d'Alger, la Perruche à collier a un régime alimentaire végétarien fort varié : nous y avons recensé les fruits, les graines, les fleurs, les feuilles, et même le thalle de 40 espèces végétales différentes (TAB I), les plantes importées (19 espèces) étant à peu près autant mises à contribution que les plantes indigenes (21 espèces). Dans presque tous les cas, la perruche ne semble curieusement consommer qu'un organe, fruit, graine, feuille ou fleur, par espèce végétale Elle ne consomme deux organes, fleurs et fruits, que chez le Néflier du Japon et le pêcher, et encore est-ce à des époques différentes. Les graines des résineux sont prélevées entières, comme certains fruits (fruits de mûrier, dattes vertes de *Washingtonia robusta*, *W. filifera* et *Phoenix canariensis*). Parfois au contraire seule la pulpe est consommée, le noyau ou les graines étant rejetées (fruits d'*Eriobotrya japonica*, *Arecastrum romanzoffianum*, *Prunus persica*, *Diospyros kaki* dattes mûres de *Phoenix canariensis*). Seuls les fruits (19 espèces) sont consommés toute l'année, les espèces se succédant les unes aux autres. Les fleurs (8 espèces) ne le sont que pendant trois périodes : janvier-février, juin juillet et septembre-novembre. Les graines ne sont ingérées que pendant des périodes beaucoup plus courtes, allant d'un à trois mois. La consommation de thalles du lichen *Xanthoria parietina* et de la mousse *Funaria hygrometrica*, qui poussaient sur les branches charpentières d'un Févier d'Amérique *Gleditchia triacanthos* (*Fabaceae*) n'a été observee qu'en février 2004, et semblait toujours être le fait des deux mêmes oiseaux

Les espèces végétales attaquées se succèdent ainsi tout au long de l'année (TAB. I), selon la disponibilité de leurs sources de nourriture, floraison pour les fleurs et maturation pour les fruits et les graines La diversité de l'alimentation de la Perruche à collier est maximum au milieu de l'été, de juin à août (7 à 9 espèces), et aussi, de façon un peu moins marquée, au cœur de la mauvaise période, d'octobre à février (6 à 13 espèces), de même qu'en avril (6 espèces). Cette plus grande diversité en hiver et au printemps viendrait peut-être du fait que les ressources les plus recherchées sont alors moins abondantes, forçant les oiseaux à diversifier leur alimentation.

Au contraire, c'est pendant les mois de mars et mai que la diversité alimentaire de la Perruche à collier est la plus faible, avec 3 espèces seulement. Ces oiseaux disposent sans doute à cette époque de leur nourriture préférée, fruits du Néflier du Japon, du Mûrier blanc et du Mûrier noir, en quantité suffisante pour ne plus guere s'interesser aux autres plantes. En effet *Eriobotrya japonica* est cultivé en grandes plantations totalisant 800 ha dans la plaine de la Mitidja. La présence d'une quinzaine de variétés, notamment "Tanaka", "Victor", "Saint-Michel", "Dr Trabut", "Léon Ducellier" et "Taza" dont la floraison s'étale de septembre à janvier et la fructification d'avril à juin assure aux perruches un approvisionnement abondant sur de longues périodes

Les dattes du Palmier des Canaries *Phoenix canariensis* de la région d'Alger ne murissent pas en même temps sur tous les pieds, mais de façon étalée sur toute l'année, ce qui assure aux perruches un approvisionnement assez régulier (TAB. I). De début novembre à fin février ces dernieres consomment même des dattes encore petites et vertes, peut être parce que les autres sources de nourriture ne sont plus très abondantes. Enfin, les

TABLEAU I. – Végétaux consommés par la Perruche à collier dans la région d'Alger.
Plant diet of Ring-necked Parakeet in the Algiers region

ESPÈCES VÉGÉTALES CONSOMMÉES	Mois I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Funaria hygrometrica (*)		Fe										
Xanthoria parietina (*)		Th										
Phoenix dactylifera (*)	Fr	Fr									Fr	Fr
Livistona chinensis	Fr v	Fr										Fr v
Livistona humilis		Fr										
Chamaerops humilis (*)		Fr										
Dracaena draco			Fr									
Enterolobium timbouva				Fr								
Prunus amygdalus (*)	Fl	Fl										
Malus pumila (*)		Fl										
Pirus communis (*)		Fl										
Eriobotrya japonica			Fr v	Fr	Fr				Fl	Fl	Fl	
Mangifera indica				Fr								
Cupressus sempervirens (*)				Gr								
Morus alba (*)				Fr	Fr	Fr						
Morus nigra (*)				Fr	Fr	Fr						
Eucalyptus camaldulensis							Fl					
Ficus retusa		Fr				Fr	Fr					
Tipuana speciosa						Fl	Fl					
Callitris articulata (*)								Fr v	Fr v			
Pinus halepensis (*)								Gr				
Pinus pinea (*)								Gr				
Pinus pinaster (*)								Gr				
Prunus persica (*)		Fl				Fr	Fr	Fr				
Prunus armeniaca (*)						Fr	Fr	Fr				
Prunus [illegible] (*)							Fr					
Persea americana							Fr	Fr				
Punica granatum (*)									Fr			
Chorisia speciosa									Fl	Fl		
Carya tomentosa									Gr	Gr	Gr	
Latania borbonica										Fr v	Fr	
Juglans regia (*)										Gr		
Diospyros kaki										Fr	Fr	
Olea europaea (*)	Fr										Fr	Fr
Washingtonia robusta									Fr v	Fr	Fr	
Washingtonia filifera										Fr v	Fr	
Phoenix canariensis	Fr v	Fr v				Fr	Fr				Fr	Fr
Arecastrum romanzoffianum						Fr v	Fr					
Podocarpus sp.	Fr										Fr	Fr
Melia azedarach (*)	Fr	Fr	Fr									Fr

Fr : fruit, Fr v : fruit vert, Fl : fleur, Fe : feuille, Gr : graine, Th : thalle
(*) : espèces indigènes

perruches n'exploitent les autres espèces végétales que pendant un temps beaucoup plus court dans l'année, quatre mois en hiver pour le Palmier dattier *Phoenix dactylifera* et le Lilas de Perse *Melia azedarach*, trois mois au plus pour les autres, un mois ou même moins pour certaines comme les graines de *Pinus* et de *Cupressus* et les fruits d'*Enterolobium*. En automne, *Psittacula krameri* peut s'attaquer à des fructifications aussi dures que des noix de Pacanier ou de Noyer commun, certes très rentables énergétiquement, mais dont l'ouverture demande une dépense d'énergie notable, et ce, même si d'autres sources de nourriture d'accès plus facile existent à cette époque, en particulier en octobre et novembre (TAB. I). Si les noyers sont rares dans la région, les pacaniers y sont dispersés un peu partout, souvent dans des jardins de particuliers.

L'introduction de nombreuses espèces végétales fructifères d'origine tropicale dans le Jardin d'essai du Hamma au cours de la période coloniale 1860-1962, suivie de leur dispersion dans les jardins de particuliers du Sahel algérois et de la frange septentrionale de la plaine de la Mitidja a permis de diversifier les disponibilités alimentaires des oiseaux de la région, exotiques ou non. De plus, ces plantes introduites sont souvent utilisables par les oiseaux à un moment où les espèces autochtones, spontanées ou d'ornement, ne le sont plus, ou bien peu (TAB. I). Leur dissémination au sein de la région ne constitue pas un obstacle à leur utilisation par les perruches, qui sont capables de parcourir de grandes distances de leur vol rapide et direct.

Au printemps la Perruche à collier recherche sa nourriture plutôt individuellement, ou bien en couples à l'approche de la période de reproduction. Au contraire, en automne, lorsque les ressources trophiques deviennent plus rares, elle forme des groupes de quatre à une vingtaine d'individus. Elle se déplace beaucoup lorsqu'elle s'alimente, prélevant souvent la tête en bas, quelques fruits, morceaux de fruits ou pétales de fleurs avant d'aller un peu plus loin. Lorsqu'une source de nourriture devient abondante, elle est capable de l'utiliser pendant une longue période avant de passer à une autre. C'est ainsi que d'avril à juin 2003 de petits groupes de perruches venaient à El Harrach visiter les pieds de Mûrier blanc *Morus alba*, nombreux à cet endroit et dont les baies arrivaient à maturation. Les perruches arrivaient presque tous les jours entre 7 heures et 8 h 30 et entre 17 h 15 et 19 h 30, moins souvent aussi entre 12 h 45 et 14 h 15. Leurs visites ne cessèrent qu'au 15 juin, lorsque toutes les mûres eurent disparu. De même, on les voyait presque chaque jour à Bainem et au parc zoologique de Ben Aknoun en train de prélever des baies d'Oléastre *Olea europaea oleaster* de novembre 2002 à janvier 2003.

Du fait de leurs faibles effectifs, les Perruches à collier ne sont pas encore considérées comme nuisibles aux plantes cultivées (bibacier, avocatier, manguier, olivier) en Algérie. Mais la situation pourrait changer si leur nombre venait à s'élever de façon trop importante. Dans les autres régions où elle a été introduite et prolifère (Grande-Bretagne, Allemagne, Belgique, France, Etats-Unis), la Perruche à collier s'est déjà signalée par des déprédations aux arbres fruitiers (TAVISTOCK, 1928 ; FORSHAW, 1989 ; JUNIPER & PARR, 1998). En Inde, un de ses pays d'origine, elle peut causer d'importants dégâts aux cultures (SHIVANARAYAN et *al.*, 1981, COLLAR, 1997).

Nos observations sur la nourriture de la Perruche à collier dans la région d'Alger sont en accord avec celles d'autres auteurs, comme TAVISTOCK (1928), CRAMP *et al.* (1994), ETCHÉCOPAR & HÜE (1964), FORSHAW (1989), ALI & RIPLEY (1981), SHIVANARAYAN et *al.* (1981), MOULAI (1997) et JUNIPER & PARR (1998), tant dans l'aire de distribution naturelle de l'espèce que dans les régions où elle a été introduite. Elles illustrent bien la plasticité de cette espèce, capable de tirer profit des espèces végétales les plus diverses, même inconnues dans son pays d'origine. On peut d'ailleurs remarquer que, pour le moment du moins, la Perruche à collier se maintient essentiellement en Algérie dans l'étage bioclimatique subhumide à hiver chaud (température moyenne égale ou supérieure à + 7 °C.) ou tempéré (température moyenne comprise entre + 3 et + 7 °C.), particulièrement favorable au développement de nombreuses espèces végétales fructifères. La douceur du climat et l'abondance de nourriture ne suffisent peut-être pas à expliquer le maintien et la multiplication de la Perruche à collier dans la région d'Alger. La fermeture du jardin du Hamma au public pendant environ sept ans, de 1990 à 1998, a certainement beaucoup contribué à ce que cette espèce puisse nicher et se multiplier en toute tranquillité. Il est aussi fort possible que des nidifications plus discrètes se soient produites dans d'autres grands jardins comme ceux du palais des Pins maritimes, de l'Institut national agronomique près d'El Harrach, du parc zoologique de Ben Aknoun, du musée du Bardo, de Mont Riant (Télémly), de Notre Dame d'Afrique (Bab El Oued), de l'ambassade de France (Hydra), ou dans des forêts voisines comme celles de Bainem, de Bouchaoui et du marais de Réghaia.

Les quelques journées de gel et de neige qu'a connues la région d'Alger à la fin du mois de janvier 2005, et en particulier les 26 et 27 janvier (jusqu'à -7 °C en fin de nuit et -1 dans la journée) ne semblent pas avoir eu de conséquences bien sensibles sur les Perruches à collier, et en particulier sur leur mortalité. Tout au plus a-t-on assisté à une diminution de l'activité des oiseaux, qui n'ont pratiquement pas été notés pendant quelques jours.

Cet épisode froid a sans doute été trop bref pour avoir des conséquences très fâcheuses pour les Perruches à collier, contrairement à ce que TAMARA & ARNHEM (1996) ont constaté pour la population férale de cette espèce à Bruxelles, où le climat est bien plus sévère qu'à Alger. De telles périodes froides sont d'ailleurs fort rares dans l'Algérois. Les périodes de fort vent semblent gêner fortement les perruches, qui se réfugient alors dans des abris, anfractuosité de roche, trou d'arbre, dessous de toît difficile d'accès de grand immeuble etc., mais l'influence exacte de ce facteur reste à étudier. Le rôle des rapaces, en particulier nocturnes, dans la régulation de sa population algéroise est encore inconnu, et à préciser. La plus grande cause de mortalité semble résider dans les destructions et les captures, car aucun texte de loi ne protège cette espèce en Algérie. Bien plus, *Psittacula krameri* fait l'objet d'un commerce florissant dans les souks du vendredi de plusieurs villes algériennes, jusqu'à Tlemcen et Constantine où elle est exportée. Il est possible que ce commerce résulte de l'établissement de populations férales encore inconnues en d'autres points du territoire algérien, mais nous ne sommes guère renseignés sur ce point, à part les seuls trois cas signalés dans l'introduction.

CONCLUSION

Seize ans après, les descendants des quelques couples de Perruche à collier échappés de volières réussissent à se maintenir et se reproduisent en liberté à Alger, dans le Sahel algérois et dans la plaine de la Mitidja. Les disponibilités alimentaires enrichies par l'introduction entre 1860 et 1962 dans le Jardin d'essai du Hamma d'espèces végétales fructifères d'origine tropicale et leur dissémination sur le littoral algérois permettent d'expliquer en partie la vigueur de la dynamique de la population de cette espèce. En perspective il faudra préciser les relations qui existent d'une part entre la Perruche à collier et les plantes nourricières et d'autre part entre ce Psittaciforme et ses prédateurs.

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3713 : LA FAUVETTE ORPHÉE *Sylvia hortensis* NICHE JUSQU'À 1800 M DANS LES ALPES DU SUD

Orphean Warbler Sylvia hortensis *breeds up to 1800 m above sea level in the southern Alps.*
In the southern Alps (i.e. Pre-Alps near Digne), Orphean Warbler often breeds at high altitude. It is found in areas grazed by sheep with well-spaced high bushes especially wild roses. The species is common in this characteristic though localised habitat. This biotope is found mainly near occupied or abandoned villages and hamlet (900-1200 m asl) as well as in the lower part of alpine meadows (1300-1500 m asl) often on east to north facing slopes. On south facing slopes alpine meadows are rare, if not totally absent, the species can be found higher around 1800 m asl. In the pre-Alps around Digne the Orphean Warbler is more easily found in the mountains than in the valleys plains or plateaux (500-600 m asl). At lower altitudes the species originally scarce and rare in oak forest has declined between 1960 and 2000 following reparcelling, the increase in large scale irrigated cultures and uncontrolled urbanisation (individual homes and housing estates)

La Fauvette orphée niche communément en altitude dans les Alpes du Sud. Elle monte nettement plus haut que la Fauvette mélanocéphale, la Fauvette pitchou, et même que la Fauvette passerinette. Les observations ci-après ont été effectuées annuellement de 1962 à 2005, principalement dans les Préalpes de Digne (Sisteron). En altitude, l'Orphée habite notamment les buissons élevés (> 1,80 m) parsemant les sols herbeux ras, pâturés par les ovins ou parfois les bovins. Schématiquement, cet habitat semi-ouvert se rencontre dans les Préalpes de Digne à deux niveaux et d'abord à proximité des villages ou hameaux, habités ou ruinés, situés de 900 à 1 200 m d'altitude, dans les champs envahis de place en place par les églantiers. La Fauvette orphée y est très régulièrement présente. Au-dessus de ces villages, lorsqu'on s'élève dans la montagne, on traverse une ceinture boisée où l'espèce manque. Puis, au-delà de cette ceinture, réapparaissent les terrains ouverts, en l'occurrence les pelouses alpines, parsemées parfois, dans leur partie inférieure, de hauts buissons, souvent là encore de hauts églantiers. La Fauvette orphée réapparaît alors souvent, l'altitude approximative de cette seconde zone est de 1300 à 1500 mètres, et elle est située normalement à l'ubac, sur les versants est, parfois nord des reliefs. À l'adret, cette seconde zone n'existe généralement pas, car les adrets sont souvent plus abrupts, plus rocailleux, et n'offrent que rarement des pelouses alpines. Quand c'est pourtant le cas, les gazons alpins émaillés de buissons abritant l'Orphée sont situés plus haut : j'ai entendu l'Orphée chanter à 1 800 mètres d'altitude dans les Préalpes de Digne. Dans les alpages méridionaux, l'Orphée voisine souvent avec l'Alouette lulu *Lullula arborea*, le Merle de roche *Monticola saxatilis* ; j'ai entendu dans un site son chant accompagné en contrebas par celui du Tétras lyre *Tetrao tetrix*. Au total, l'altitude par elle-même ne semble pas jouer un rôle déterminant pour l'Orphée, mais bien l'occurrence d'un certain habitat, clairement défini, lui, et dont l'altitude varie selon l'exposition du versant et la localisation des villages et des pâturages. Avec une certaine habitude, les sites favorables à l'Orphée peuvent souvent, dans les Alpes du Sud, être repérés visuellement à grande distance : un sol herbeux plus vert, des buissons plus hauts qu'ailleurs, contrastant avec un paysage dans l'ensemble plus gris, âpre, minéral et stérile.

En dehors de la montagne, à basse altitude (500 - 600 m environ), dans les vallées de la Durance, de la Bléone, *etc.*, l'Orphée a toujours été clairsemée, ces 40 dernières années tout au moins. Remarquons qu'à basse altitude, les activités humaines diffèrent quelque peu : la part des cultures y est plus grande, et celle de l'élevage ovin moindre qu'en montagne. En plaine, l'Orphée fréquente çà et là les haies buissonnantes bordant un champ. On la trouve aussi en de rares points de la chênaie pubescente, là où cette chênaie est relativement espacée, pousse sur un sol assez dégagé et présente des arbres touffus de hauteur moyenne. Mais ces conditions sont rarement réunies. Au contraire, le fait général et marquant est que l'Orphée est absente de la chênaie pubescente, cette forêt, pour ce qui est des fauvettes méditerranéennes, est plutôt le domaine de la passerinette. Signalons en outre que dans les vallées, plateaux et plaines, les habitats de l'Orphée, déjà originellement clairsemés, se sont encore beaucoup raréfiés avec le remembrement, la destruction des haies, et la généralisation des grandes cultures irriguées d'un seul tenant, rendues possibles par les barrages sur la Durance et le Buech. La vogue, nouvelle dans la région, d'un habitat humain dispersé, sous forme de lotissements et de

villas éparses détruisant de vastes espaces y a aussi largement contribué

L'Orphée a donc fortement régressé en plaine, où elle n'a jamais été abondante En montagne en revanche, aucune évolution sensible des effectifs n'a été notée de 1962 à 2005 La montagne semble avoir toujours abrité, dans la région et pour la période considérée, l'essentiel des habitats de l'espèce. Elle y est encore bien représentée Certes, les habitats favorables en montagne ne couvrent pas des surfaces très vastes, mais, au sein de ces habitats, l'Orphée est commune et facile à trouver. En plaine, par contre, sa distribution est moins attachée à un milieu clairement défini, plus capricieuse, plus sporadique, et plus sujette à des variations annuelles peu observées en montagne.

Les recherches de nids ont été volontairement exclues, pour préserver la tranquillité d'une espèce globalement peu nombreuse. Cependant, la présence de nombreux chanteurs cantonnés durant toute la saison de nidification, dans des biotopes bien définis, à des endroits identiques ou voisins d'une année sur l'autre et sur 40 années consécutives, laisse planer peu de doutes quant à la nidification de l'espèce.

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3714: REPRODUCTION DE LA GUIFETTE MOUSTAC *Chlidonias hybridus* DANS LE PAS-DE-CALAIS EN 2001 ET 2002

En France, la Guifette moustac se reproduit dans la moitié sud de la France sur moins d'une dizaine de sites Le recensement 2000 place en tête les étangs de la Dombes (920 couples) suivis de la Brenne (685 couples), du lac de Grand Lieu (419 couples), de la Grande-Brière (190-210 couples), de la Sologne (142 157 couples) et du Forez (145 couples). L'espèce niche aussi dans le Cher (19 couples en 1990) et de façon irrégulière en Camargue. En 2002 (dernier recensement disponible), la population française, estimée à 2336-2388 couples accusait une baisse des effectifs de près de 30 % par rapport à 2001 (3211-3334 couples) après plusieurs années de hausse

Dans la moitié nord de la France, des tentatives de nidification ont eu lieu en 1995 dans les marais de Carentan (Manche) (5 nids detruits) et à Tigny-Noyelles (Pas-de-Calais) où un nid a été construit puis très vite abandonné (L. GAVORY *fide* J MOUTON). C'est dans ce même département qu'en 2001, 2 couples se sont reproduits avec succès, menant 4 jeunes à l'envol En 2002, ce sont 4 couples qui ont élevé 6 à 7 jeunes

La reproduction en 2001 et 2002

Le 9 juillet 2001, lors d'une visite de contrôle aux bassins de décantation de Brebières (Pas-de-Calais), une Guifette moustac nous survole tenant une proie dans le bec. Nous découvrons un couple avec un jeune déjà emplumé. Cette famille sera revue le 10 juillet. Le 12, ce sont deux familles qui sont notées: le couple accompagné de trois jeunes qui volètent déjà et un adulte ravitaillant un juvénile déjà assez grand lui aussi La végétation abondante à cette époque de l'année nous avait caché ces oiseaux. De plus, la grande distance à laquelle nous observions pour ne pas perturber les adultes, nous avait privé de certains détails. Le 15 juillet, les guifettes ne sont plus sur les nids, 2 adultes et 2 jeunes volent

En 2002, nous décidons de suivre plus fréquemment le site Le 28 avril, nous repérons un premier oiseau sur un bassin proche. Le 5 mai, deux guifettes pêchent sur le site où a eu lieu la nidification en 2001. Le 20 mai, au moins deux couples (sur 6 oiseaux présents) construisent. Le 25 mai, nous dénombrons une "micro colonie" de 4 couples, les 4 femelles semblent couver. Le 19 juin, nous soupçonnons la naissance des premiers poussins Le 23 juin, trois nids contiennent chacun 2 poussins âgés d'une semaine à 10 jours Le quatrième nid compte 2 ou 3 poussins. Le 6 juillet, nous ne comptons plus que 7 jeunes âgés d'environ

3 semaines Les adultes sont actifs et nourrissent (petit poisson et jeune grenouille). Les juvéniles commencent déjà à voleter et se font houspiller par les Mouettes rieuses présentes Les adultes rechargent les nids devenus fragiles pour supporter les jeunes. Le 10 juillet, il n'y a plus que 6 jeunes Le 15 juillet, il ne reste plus qu'un jeune et 2 adultes.

Description du site

Il s'agit d'un ensemble composé de 4 bassins dans lesquels décantent les rejets d'une papeterie. Le bassin sur lequel ont niché les guifettes n'est plus utilisé pour les déversements et n'est plus alimenté que par les eaux pluviales

De nombreuses espèces aquatiques y nichent. Tadorne de Belon, Canard chipeau, Canard colvert, Sarcelle d'été, Canard souchet, Fuligule milouin, Fuligule morillon. Le Grèbe castagneux, la Foulque macroule et la Poule d'eau sont des nicheurs communs Le Grèbe à cou noir y nidifie depuis 1988 mais la population est fluctuante, passant de quelques couples à plusieurs dizaines selon les annees avec en 2001, un chiffre remarquable de 82 couples nicheurs. Les roselières à typhas accueillent une importante colonie de Mouettes rieuses (plusieurs centaines de couples). Un ou deux couples de Mouette mélanocéphale nichent irrégulièrement. Les vasières permettent aussi l'installation de quelques couples d'Échasse blanche et parfois d'Avocette élégante.

Le bassin où ont niché les guifettes offre une mosaïque de milieux: eau libre (sur plus de la moitié de la surface), typhaie, vasières Quelques jeunes saules y sont aussi présents. La faible profondeur permet à une végétation immergée de poindre en surface, laissant apparaître quelques tiges sur lesquelles les Guifettes moustacs ont construit leurs nids flottants L'importante colonie de Mouettes rieuses (plusieurs centaines de couples) dont profitent déjà les Grèbes à cou noir a certainement eu un effet attractif Mis à part les bassins, les adultes en quête de nourriture ont été vus sur deux autres sites. Il s'agit d'étangs et de plans d'eau situés à environ 5 km du site de nidification

En 2003, le site a attiré des migrateurs fin mai et début juin Mais le bassin ne restera pas assez long temps en eau et les guifettes ne s'installeront pas. Le même scénario se produira en 2004. une seule observation de 4 Guifettes moustacs le 4 mai (bassin presque à sec).

Remarques et perspectives pour l'avenir

Ce cas de nidification est original puisqu'il constitue d'une part le premier cas de reproduction réussi au Nord de la Loire et que d'autre part c'est la première fois que l'utilisation de bassins de décantation est signalé alors que la Guifette moustac se cantonne régulièrement en France à un seul type d'habitat les étangs de pisciculture. Soulignons au passage l'importance de ces bassins qu'ils soient de sucrerie ou de papeterie et qui constituent des milieux de substitution au sein desquels les oiseaux d'eau trouvent tranquillité, nourriture et sites de reproduction.

La Guifette moustac est une espèce réputée instable, quittant brusquement un site fréquenté pendant plusieurs années pour aller se fixer ailleurs. Dans le cas présent, ce sont les mauvaises conditions (manque d'eau) en 2003 et 2004 qui ont éloigné les oiseaux Si les circonstances deviennent plus favorables, une nouvelle installation n'est pas exclue

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3715: THE HOOPOE *Upupa epops* AS PREY OF BARN OWL *Tyto alba* IN THE CANARY ISLANDS

La Huppe fasciée Upupa epops, *proie de la Chouette effraie* Tyto alba *aux Iles Canaries.*

Although birds are secondary items in the diet of the Barn Owl *Tyto alba*, some cases in capture specialization (HEIM DE BALSAC, 1965, CARPENTER & FALL, 1967, FERNÁNDEZ-CRUZ & GARCIA, 1969, etc.), selection (cf BUNN *et al.*, 1982; BARBOSA *et al.*, 1989) and consumption of exceptional species have been described. With respect to the latter, worthy of mention is the capture of large species such as *Fulica americana* (SMITH & MARTI, 1976), *Gallinula chloropus* (CRAMP, 1985) and various raptors (*Falco sparverius* [SMITH & MARTI, 1976], *F. naumanni*, *Otus scops* [SIRACUSA & CIACCIO, 1985], etc) In this note, the presence of the Hoopoe *Upupa epops* in the diet of the Barn Owl in the Canary Islands is reported, a fact which, according to the bibliography and ornithologists consulted (Appendix and Acknowledgments), apparently constitutes the first known record, at least in the Western Palearctic

Predation has been confirmed at two localities on the island of Tenerife (Los Realejos, 24 February 1978, Granadilla de Abona, August 1986) and at a single site on the island of Lanzarote (Teguise, 14 January 2001). At the three localities, feathers pertaining to 1-2 Hoopoes were found dispersed at the base and in the interior of Barn Owl nesting cavities. Also a pellet containing a Hoopoe skull was located at one site. Furthermore, J C RANDO (pers comm.) identified bones of one adult Hoopoe together with other subfossil remains (mainly of Procellariiformes) which can be ascribed to predatory activity of the Barn Owl in the past This material was collected in a superficial level of an archaeological deposit situated on the north coast of Tenerife (M C. LEÓN *leg*), and now forms part of the island's *Museo de la Naturaleza y el Hombre*

Although the Hoopoe is larger than the bird species usually captured by Spanish Barn Owls (cf. BARBOSA *et al.*, 1989), its presence or absence in the diet of this owl is most probably related to hunting opportunities as opposed to the imposition of a size restriction. The wide chronological separation of our data in the Canaries tends to indicate that favourable conditions for capturing Hoopoes are infrequent Moreover, future cases of predation will become even less frequent due to the continued decline of the species in the Archipelago, especially in the western islands (MARTÍN & LORENZO, 2001) On Tenerife our data were obtained in areas of the lower xerophytic vegetation zone, between 50-150 m. a s.l., where both species concentrate their distribution range (MARTÍN, 1987; SIVERIO & CARRILLO, 1993) Judging by our observation dates in both islands (cf MARTIN, 1987; MARTÍN & LORENZO, 2001), the Hoopoes captured were most likely young birds which are more vulnerable to predation

In general, the Hoopoe is barely exploited by raptors, and its capture very rarely acquires importance (cf BERGIER, 1987). In the Canary Islands, predation by Long-eared Owl *Asio otus* (pers obs.), Eleonora's Falcon *Falco eleonorae* (HERNANDEZ *et al* , 1985) and Sparrowhawk *Accipiter nisus* (DELGADO *et al.*, 1988) seems to be very rare, although in some areas of mainland Spain the latter species is its principal predator (M MARTÍN-VIVALDI, *in litt.*).

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APPENDIX

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EN BREF...

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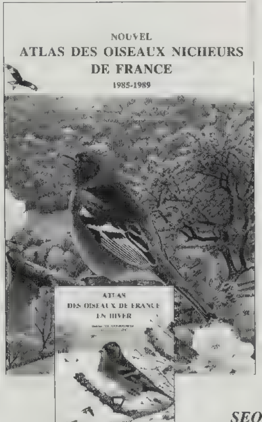
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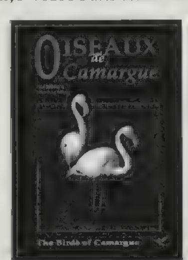
■ *Alauda* (2) 2005. ***Erratum***, page 124, FIG 6a, b Dans les légendes, remplacer A= Grand Gravelot et a : Ringed Plover par A= Pluvier argenté et a : Grey Plover



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BIBLIOGRAPHIE

(Ouvrages, C.D., films déposés à la Bibliothèque de la S.E.O.F.)

Michel CUISIN, Frédéric JIGUET,
Jean-Marc PONS & Jean-Marc THIOLLAY

BAUDVIN (H.) & PERROT (Ph.) 2005. - *Alba*. 181 p. Disponible chez Philippe Perrot, 448 rue de la Roqueturière 34090 Montpellier (euros : 40 + port ou euros : 30 en nombre pour associations) - Dans les dernières années, plusieurs livres sont parus sur la Chouette effraie, ou Effraie des clochers (pour la distinguer des 13 autres espèces d'effraies), y compris trois en français (de J.L. VALLÉE chez Delachaux et Niestlé, Y. MULLER chez Eveil Nature, M. RIBETTE, Ed. Serpenois). Pourtant celui-ci se distingue de tous les autres et reflète la riche personnalité de l'auteur du texte. Hugues BAUDVIN en effet étudie les rapaces nocturnes dans sa Bourgogne depuis plus de 30 ans. Il y a déjà bagué plus de 10000 effraies et contrôlé près de 2500 pontes mais reste peu enclin aux traitements trop mathématiques et à la rédaction traditionnelle. Son livre, publié à compte d'auteur, se veut d'abord "un ouvrage préparé par des spécialistes pour le grand public" qui "privilégie le document photographique" où "les photographies parlent d'elles-mêmes". Le nouveau livre donc la synthèse de son expérience considérable sans aucun graphique ou tableau, ni statistique ou référence bibliographique, et même très peu de données chiffrées, sauf pour la reproduction. Il ne parle guère que de ce qu'il connaît bien, c'est-à-dire les effraies de Bourgogne, ne se risquant que brièvement en passant à des comparaisons avec d'autres régions ou pays. Il en résulte un texte clair, homogène, extrêmement instructif et documenté, aisément accessible à tous et illustré à chaque page de splendides photos, toutes d'oiseaux sauvages et bourguignons. Malgré tout, les auteurs ont voulu que leur inestimable expérience profite aux naturalistes hors de nos frontières et le texte est donc bilingue, chaque page ou double page étant également partagée entre les textes français et anglais. Chaque double page est un mini-chapitre, avec un titre très bref, qui fait sobrement le tour de la question, quitte à bousculer quelques idées reçues. Tous les aspects de la biologie et de l'écologie de l'Effraie des clochers sont ainsi passés en revue depuis ses adaptations anatomiques jusqu'à ses rapports avec ses proies ou ses prédateurs. Les problèmes de conservation et leurs solutions occupent aussi une grande place (76 pages) et résument là encore l'expérience d'une vie entière passée à la protection tout autant qu'à l'étude des chouettes. Malgré une lecture attentive, je n'ai pas vraiment trouvé à redire, sauf page 66 où il ne faudrait pas laisser croire que les effraies ne sont pas exposées aux empoisonnements de rongeurs parce qu'elles ne chassent que des proies vivantes et actives : les études anglaises ont montré les taux élevés de résidus de bromadiolone notamment chez les effraies habitant des fermes où sévissaient les raticides. On ne peut donc que recommander vivement l'achat et la lecture de ce livre aussi beau qu'enrichissant et d'aider ainsi à l'édition du suivant qui concernera la Hulotte qu'Hugues BAUDVIN étudie aussi depuis de nombreuses années. J.-M.T.

BECKER (P.H.) & MUNOZ CIFUENTES (J.) 2004. *Contaminants in bird eggs. Recent spatial and temporal trends.*
MUNOZ CIFUENTES (J.). – *Seabirds at risk? Effects of environmental chemicals on reproduction success and mass growth of seabirds at the Wadden Sea in the mid 1990s.* Wadden Sea Ecosystem n° 18. Common Wadden Sea Secretariat. D 26382 Wilhelmshaven. 52 p. ISSN 0946-896 X - Dans cette publication sur l'écosystème de la Mer des Wadden sont exposés d'une part les résultats des études sur le niveau de contamination des œufs d'oiseaux par des substances polluantes en 2002 et, d'autre part, l'évolution de ces niveaux pendant trois périodes (1981-2003, 1991-2003 et 1998-2003). L'estuaire de l'Elbe figure parmi les lieux les plus contaminés. Les prélèvements sur des œufs de Sterne pierregarin et

d'Huîtrier pie ont été effectués dans 13 sites répartis entre les Pays-Bas et le Danemark. Substances analysées : PCB, HCH, HCB, DDT, chlordanes et mercure. La pollution des œufs de ces deux espèces a diminué depuis le début de la décennie 1990-2000 dans la partie allemande mais de 1998 à 2003, elle a augment de nouveau. Les niveaux relevés sont en général inférieurs à ceux jugés dangereux pour la reproduction, mais une surveillance permanente reste indispensable. La seconde étude montre les effets de cette pollution sur la reproduction (œufs et croissance des poussins) de la Sterne pierregarin, des Goélands argenté et cendré et de la Mouette rieuse dans 6 colonies (1995-1996). Les deux premières espèces sont les plus polluées, et la plus sensible est le Goéland cendré. La Mouette rieuse ne semble pas avoir été affectée. En conclusion, les polluants semblent avoir un effet sur le succès de la reproduction mais d'autres facteurs doivent être pris en compte (quantité et qualité de la nourriture, perturbations dues à l'homme, conditions climatiques ...) et il faut préciser la part de chacun. M C.

BEOLENS (B.) & WATKINS (M.) 2003. *Whose birds? Men and women commemorated in the common names of birds*. C.Helm, Londres 400 p. £: 17.99. ISBN 0-7136-6647-1.- En Grande-Bretagne, de nombreux oiseaux ont reçu un nom vernaculaire qui perpétue la mémoire d'une personne -naturaliste ou non- à laquelle on a voulu rendre hommage pour diverses raisons. Ce livre offre la biographie résumée de tous ceux et celles auxquels ont été dédiés des oiseaux. Au total, 1 124 notices relatives à 2 246 espèces et sous-espèces. Pour des raisons évidentes (développement considérable de l'ornithologie) c'est au XIXe siècle que la plupart de ces noms ont été attribués. Chaque entrée comprend le nom du dedicataire, les noms vernaculaires anglais et le ou les noms scientifiques suivis d'une relation de la vie de la personne (de 3 lignes à une page). Un portrait accompagne le texte dans de nombreux cas. Ouvrage très intéressant car il montre l'édification progressive de l'ornithologie jusqu'à nos jours. M C

BORROW (N.) & DEMEY (R.) 2004.- *Field guide to the birds of Western Africa*. C. Helm, Londres 512 p. £: 29.99. ISBN: 0-7136-6692-7.- En 2001, les auteurs de ce guide ont publié chez le même éditeur *Birds of Western Africa*. Ici, il s'agit d'un guide pratique richement illustré, accompagné de cartes, mais au texte très bref. 1 304 espèces sont présentées sur 148 planches, reprises de l'ouvrage précédent. Le texte relatif à chacune occupe 2 à 8 lignes (plumage, répartition, comportement typique, statut, habitat et, le cas échéant, référence aux disques de notre collègue C. CHAPPUIS (2000). L'introduction signale des modifications d'orthographe de certains noms (d'après DAVID & GOSSELIN, 2002) et des changements de noms, elle comporte aussi une courte description de la géographie et indique les zones d'endémisme. La déception vient de l'impression des planches où les couleurs sont très souvent saturées et trop sombres (exemples : rapaces diurnes, engoulevents, trogons, fauvettes, gobemouches de paradis, *etc*) Les quatre dernières représentent des oiseaux présents sur les îles du Cap Vert et du Golfe de Guinée. M. C.

DEN HENGST (Jan) 2003.- *The Dodo. The bird that drew the short straw*. Art Revisited, Transportweg 15, 9363 TL, Marum, Pays-Bas.119 p. £: 20.00. ISBN 90-72736-26-5. Rassemblant de très nombreuses illustrations sur le Dodo, ce livre est l'aboutissement des recherches menées par l'auteur pendant 15 ans pour essayer de trouver les illustrations qui pourraient nous donner une idée aussi exacte que possible de l'aspect du Dodo. Il comprend 13 chapitres : histoire de l'oiseau, de sa disparition ; commentaires détaillés des représentations qui en ont été faites et des reconstitutions tentées à partir des quelques restes dont on disposait. Les différentes opinions sur sa place dans la classification sont également exposées. Bibliographie et explications des illustrations. Dans son avant-propos, J. DEN HENGST déplore que l'on ne soit toujours pas absolument certain de l'aspect du Dodo. Il pense que seules certaines illustrations anciennes pourraient nous renseigner, mais beaucoup ont été copiées ou recopiées. Il a comparé celles du XVIIe siècle, ce qui n'avait pas été fait auparavant et il en arrive à tracer un portrait vraisemblable. La plus récente des reconstitutions, celle de J. PARISH (1997) a été faite d'après des squelettes du British Museum, de l'Université de Cambridge et d'autres sources. Étude fouillée et intéressante car l'auteur a comparé et soumis à la critique constructive tout ce que l'on sait du Dodo. Très bonne présentation. M. C

ERIKSEN (H. & J.) & SARGEANT (P. et D.E). 2001. *Birdwatching guide to Oman*. Al Roya Publishing, Muscat, Sultanate of Oman, 256 p. £: 20.00 - Vous n'aviez jamais envisagé d'aller pratiquer l'ornithologie en Oman, et bien voilà un superbe ouvrage qui va vous donner instantanément envie d'y aller au plus vite. On y trouve un descriptif du statut de chaque espèce, avec des tableaux qui signalent leur présence dans différentes zones géographiques du sultanat, ainsi qu'un long descriptif détaillé des sites majeurs

pour l'observation des oiseaux, incluant des plans précis et conviviaux. Le tout est illustré de superbes photographies d'oiseaux, comme on aurait pu l'attendre des deux premiers auteurs, mais aussi de superbes clichés de paysages et d'ambiances, qui illustrent la magie des contrastes paysagers de ce petit territoire de la péninsule arabique, et qui fait rêver avant d'y aller (des cocotiers sur la plage aux déserts). On trouve également une multitude d'informations pratiques pour organiser un voyage, depuis les règles d'habillement à respecter jusqu'à une liste d'hôtels dans chaque ville avec une indication sur les tarifs. Bref, c'est un magnifique livre qu'il est urgent d'acheter pour enfin se préparer à effectuer un voyage ornithologique en Oman. F. J.

ISENMANN (P.), GAULTIER (T.), EL HILI (A.), AZAFZAF (H.) DIENSI (H.) & SMART (M.) 2005.– *Oiseaux de Tunisie*. S. E. O. F., 432 p. Euros: 38,00. ISBN: 2-9506548-0-4. .- Après tant d'années d'attente, voici enfin un ouvrage couvrant l'avifaune de ce magnifique pays ! Cet ouvrage complet est rédigé en deux langues (français et anglais), ce qui le rend accessible au plus grand nombre mais double son volume et sa masse. Ce n'est toutefois pas un guide de terrain, mais une synthèse exhaustive sur la distribution, le statut et quelques données d'écologie de toutes les espèces d'oiseaux qui ont été, à ce jour, signalées en Tunisie. Le travail bibliographique et de centralisation d'observations nécessaires à la rédaction du livre est colossal et il faut en féliciter les auteurs. Le résultat est à la hauteur des espérances avec une mine d'informations pouvant être trouvée pour chaque espèce. Pour l'ornithologue visitant le pays, l'ouvrage apporte une excellente aide pour situer les types d'habitat dans lesquels les espèces pourront être rencontrées. Pour chacune d'entre elles, on trouve des paragraphes séparés pour le statut et les données en période de nidification, de migration et d'hivernage, et quand cela est pertinent, des informations sur la phénologie de reproduction, le régime alimentaire ou les reprises d'oiseaux bagués. Une présentation des différents habitats du pays et l'historique de l'ornithologie tunisienne complètent agréablement la liste systématique commentée des espèces. Toutes les illustrations sont très belles, telle celle du Blongios nain en page 79 qui par une erreur à l'impression a été indûment attribuée au Butor étoilé ! Le seul péché, peut-être, de cet ouvrage serait le traitement taxonomique, avec souvent une interprétation libre de taxons élevés ou non au rang d'espèces, alors que le livre voit le jour deux ans après la publication des recommandations taxonomiques du comité européen compétent dans ce domaine (*AERC TAC*). Objection mineure, on notera aussi que l'île de Jerba si réputée du point de vue touristique, n'est jamais incluse dans les cartes de distribution. La Tunisie est un pays à visiter absolument, avec les "*Oiseaux de Tunisie*" dans ses valises. On attendra maintenant avec impatience un guide qui présenterait en détail les sites ornithologiques tunisiens les plus intéressants, peut-être d'ici peu par les mêmes auteurs ou quelques-uns d'entre eux ? F. J.

LANTERMANN (W.) 2001.– *Agaporniden* Verlaghaus Oertel. Spörer, Reutlingen. 240 p. DM: 29,90. ISBN: 38 8627 4012.- Ce livre en allemand présente les aspects de la biologie de reproduction et de l'élevage des différentes espèces d'*Agapornis* dites "Insépérables". On y trouvera des informations sur les types de volières et de nichoirs adaptés à ces psittacidés. Si l'ouvrage intéresse surtout les éleveurs, on y trouvera également des détails sur l'aire de répartition naturelle des espèces, les importations ou encore les tailles des populations captives, et surtout la description de certains comportements de ces espèces réputées fidèles entre partenaires. On aurait aimé voir plus d'illustrations des variantes mutantes de coloration pour chacun des taxons, ou même des exemples d'hybrides puisqu'ils existent, mais c'est avant tout un petit guide de l'éleveur que nous découvrons ici F. J.

MITCHELL (P. I.) NEWTON (S. F.), RATCLIFFE (N.) & DUNN (T. E.) 2004.– *Seabird populations of Britain and Ireland*. Christopher Helm, London, 511 pp £: 35.00. ISBN 0713669012.- Avec 25 espèces nicheuses d'oiseaux marins, l'avifaune des îles Britanniques et d'Irlande est moins diversifiée que celle installée dans notre pays. Ce constat quelque peu surprenant s'explique par la présence en France de deux façades maritimes séparées au plan géographique, l'une atlantique, l'autre méditerranéenne, aux caractéristiques océanographiques nettement différentes. Mais lorsqu'on examine les effectifs, l'importance numérique des populations britanniques et irlandaises comparée à leurs homologues françaises est manifeste. Alors que notre avifaune marine comptent environ 238000 couples, le nombre d'oiseaux Outre-Manche s'élève à 8 millions ! Ces oiseaux se répartissent dans 3300 colonies littorales distribuées le long de 40000 km de côtes et dans 900 colonies intérieures composées de sternes, de goélands et de Grands Cormorans. Le livre "*Seabird populations of Britain and Ireland*" présente, analyse et commente les données recueillies dans le cadre de l'opération "*Seabird 2000*", troisième recensement complet de

l'avifaune marine organisé conjointement en Grande-Bretagne et en Irlande entre 1998 et 2002. Le premier recensement général avait eu lieu en 1969-1970 (*Operation Seafarer*), le second entre 1985 et 1988 (*Seabird Colony Register*). L'analyse des données obtenues dans le cadre "*Seabird 2000*" permet donc d'appréhender les variations d'effectifs à l'échelle régionale et globale pour les deux pays et de dégager des tendances démographiques sur une période de 30 années. Par rapport aux premiers recensements, la Mouette mélanocéphale, devenue depuis lors une espèce nicheuse régulière en Grande-Bretagne, a été ajoutée à la liste des espèces recensées.

Le recueil de ces données de recensement a représenté un travail considérable impliquant la collaboration de 1 400 observateurs. De même le temps de saisie de toutes ces informations dans une base de données relationnelle équivaut à l'emploi à plein-temps d'une personne pendant deux années. Le livre commence par un chapitre consacré aux méthodes de recensement. L'accent est porté sur le contrôle des divers biais portant sur les estimations d'effectifs et notamment sur l'importance de tenir compte des particularités de la biologie des différentes espèces. Par exemple, la faible fidélité interannuelle au site de reproduction des sternes et des Grands Cormorans implique de compter toutes les colonies au cours de la même saison de reproduction. Le chapitre suivant est consacré au recueil et à l'analyse des données et insiste sur les procédures de contrôle mises en place pour réduire les erreurs qui ne manquent pas de survenir aux différentes étapes du processus de saisie de l'information. Viennent ensuite les 25 notices spécifiques qui constituent le cœur de l'ouvrage. Pour chaque espèce sont détaillées les méthodes de recensement (techniques employées, précision des estimations), la situation actuelle des effectifs nicheurs et les tendances démographiques depuis 30 années, les facteurs impliqués dans les changements de distribution géographique et de taille des effectifs et enfin l'importance des populations britanniques et irlandaises vis-à-vis du statut de l'espèce considérée selon les cas à une échelle biogéograhique pertinente ou à l'échelle mondiale. Le texte est complété par un tableau regroupant les estimations obtenues pour les 3 recensements par localité géographique et donnant les totaux régionaux et nationaux. Une ou deux excellentes cartes selon les espèces permettent de visualiser sans peine la répartition et l'importance des colonies ainsi que leur tendance démographique depuis le recensement 1985-1988. On peut cependant regretter l'absence de tableau récapitulatif donnant les effectifs totaux par espèce pour les trois recensements. Cela aurait permis au lecteur d'avoir, pour chaque espèce, un accès rapide aux tendances globales observées sur la totalité de la période couverte par les dénombrements. Le livre continue par un chapitre consacré aux causes démographiques et écologiques impliquées dans les tendances contrastées observées pour les 25 espèces, vaste domaine encore trop peu exploré, et par un chapitre qui souligne l'importance des populations d'oiseaux marins britanniques et irlandais une fois replacées dans le contexte international. Par exemple, plus d'un tiers des effectifs mondiaux de 5 espèces (Puffin des Anglais, Fou de Bassan, Cormoran huppé, Grand Labbe, Goéland brun) sont regroupés dans les Îles britanniques. En résumé cet ouvrage, fruit d'un travail collectif considérable, rassemble une mine d'informations et de données clairement exposées et illustrées. Il constitue ainsi un outil précieux de connaissance pour l'ornithologue et toute personne impliquée dans l'étude et la conservation des milieux et des oiseaux marins.

J.-M. P.

SOCIÉTÉ D'ÉTUDES ORNITHOLOGIQUES DE FRANCE

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La Société d'Études Ornithologiques de France accueille les données scientifiques rassemblées par des ornithologues professionnels ou amateurs et assure après validation, leur publication à destination du plus grand nombre. Elle organise et coordonne des enquêtes, suscite et oriente des travaux d'études et de recherche. Elle se tient prête à tout moment pour répondre à des demandes de collaboration nationales ou internationales. En partenariat avec les associations régionales, elle met à la disposition de tous sa riche bibliothèque et répond aux demandes de renseignements et de fourniture de photocopies sur place ou encore par courrier postal et courriers électroniques. Outre la publication d'une revue scientifique trimestrielle *Alauda*, d'audience internationale, elle a déjà développé l'édition de monographies d'espèces, de livres thématiques, de faunes nationales ou régionales, et participé aussi en partenariat à l'édition aussi de bibliographies nationales ou encore du "Livre rouge" sur les espèces menacées. Son expérience éditoriale est mise à la disposition des particuliers ou des structures associatives pour aider à la publication d'ouvrages scientifiques, de disques-compacts et d'actes de colloques nationaux ou régionaux.

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